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**GARDENING UNDER GLASS**







Think of a place like this, on a winter's morning! And there is no limit to the kinds of things you can grow in a glass garden—all your own favorite flowers as well as the regular greenhouse ones. This house, big as it looks, is only the width of a regular "standard" ready-made glass garden.

# GARDENING UNDER GLASS

*A little book of helpful hints  
written particularly for those who  
would extend their gardening  
joys around the twelvemonth*

*Frederick  
Wrye* BY  
F. F. ROCKWELL



GARDEN CITY                      NEW YORK  
DOUBLEDAY, PAGE & COMPANY  
1923

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AT  
THE COUNTRY LIFE PRESS, GARDEN CITY, N. Y.

*First Edition*



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ACKNOWLEDGMENTS

THIS little book on growing flowers, fruits, and vegetables under glass has also something to say about the structures in which the growing is done. For intimate facts of that character, acknowledgment is made of the coöperation of the Lord & Burnham Company, Greenhouse Manufacturers and Builders.

In Part Two special features have been contributed by such well-known greenhouse grower experts as William Turner (Pineapples, Roses, Grapes) and W. N. Craig (Palms and Stove Plants). Mr. John Ash is responsible for "Fruit Trees in Pots the Year Round," and the chapter on "All Kinds of Greenhouses" is reproduced by permission from *The Garden Magazine*.



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PART I  
GARDENING UNDER GLASS





# *Gardening Under Glass*

## CHAPTER I

WHAT YOU NEED TO KNOW TO GARDEN UNDER  
GLASS

*In Which Are Summed Up, Briefly, the Most  
Important Things That Make for Success*

RIGHT at the beginning I put a little summary of some of the more important chapters in this book about growing things in a garden of glass. Putting a summary ahead of what is summed has its advantages, even if it isn't the orthodox way.

The sole purpose of this book is to help people to grow the things they want to grow, in their glass gardens. To attempt to do that at all thoroughly means going into a lot of details, and the details about a thing with which one is not familiar are sometimes confusing.

So, for those who have not yet had much experience in glass gardening, I want, first of all, to dispel some of the doubts which oftentimes



In the dead of winter you merely push the latch—and there is all the joy of your summer garden!

prevail; and then to make as plain as possible the general principles that lead to success.

*If You've Gardened Outside, You Can Garden Inside*

First, as to the doubt worries, be assured that if you have been successful with your flowers and plants out of doors, you can be successful with them under glass. There need be no question about that.

This statement is made with some positiveness, because I began greenhouse gardening without any experience other than what I had gained in gardening out of doors; and, while there was much to learn, I soon found that the *essentials* were the same for both kinds of gardening. So, when any person who is over-timid about glass gardening says to me, "Aren't the conditions entirely unlike? Doesn't one have to grow entirely different things? Isn't a great deal more skill and knowledge required in the glass garden



There are no dark and secret mysteries about gardening under glass. If plants will grow for you outside, they will inside—twelve months in the year.

than in the outdoor garden?"—I answer, "No."

True, conditions inside and outside are not the same, but as conditions inside are more completely under the gardener's control, there is no disadvantage in this. One quickly learns that there are limits, and about what they are, the same as in outdoor growing.

As to *what* may be grown in the glass garden, there is practically no limit except that of practicability.

Sweet Corn and Table Peas, for instance, may be grown perfectly well under glass. That usually they are not so grown is because they occupy so much space in proportion to the returns.

Most of the ordinary flowers and shrubs can be transferred to, or grown in, the glass garden. The favorites of your hardy border and your beds of annuals you may have inside as well as out, and very often of a greater luxuriousness of growth. The standard "greenhouse plants," as they are called, are only a small part of what may perfectly well be grown if one wishes to go outside the lists of the usually grown.

As to skill and knowledge, it is not necessary to start all over again when you begin under glass. All that has been learned in the outside gardening may be brought into play inside. Of course, if you are progressive, you will pick up new methods and details as you go on; but the point is that, as a start, your experience with outside gardening will enable you to begin gardening inside, with every prospect of having it go satisfactorily.

### *The Essentials of Success*

Now any gardening, even the growing of a row of Radishes or a bed of Petunias, cannot be

successful unless a few fundamental things in connection with it are right:

SOIL is the first of these things. Any one who attempts to do any kind of gardening very quickly discovers that seeds planted in some soil will come up to have only a starved and struggling existence, or to flower prematurely, and then turn yellow and die. And the same seed, with the same care, in other soil, will send up sturdy little seedlings, dark green and thrifty looking, that will "grow like weeds" and put forth blooms as though they were doing it by piece-work, at so much per dozen!

So, in the greenhouse, good soil is wanted—the kind of soil that in other garden work would be called a "rich, friable, loam"; the kind of soil that one finds in old beds that are well manured, year after year, and kept hoed and dug, till the soil in them is so mellow that one likes to dig holes in it with one's fingers to set plants in; and so suitable for plant roots that every little seed in it will sprout and start out to make a husky plant every time you leave the surface undisturbed for a fortnight or so!

Such soil is needed to make plants thrive lustily under glass, as well as outside. Usually, the same soil that is giving good results outside may be used inside.

There is, however, this difference. Under some conditions a quite heavy clay soil will give good results outside, whereas soil for inside use should always contain enough decayed vegetable matter (humus) and sand, so that it will never pack and stay heavy and wet. Even if such soil as you do have available happens to be mostly clay, it can be changed and made suitable for greenhouse use by following the suggestions given in a later chapter.

If, then, you have good, rich, mellow old garden soil already at hand, you have the groundwork for your glass gardening. If you have not, such a soil may be made up quickly by the methods suggested on pages 38 and 60. Or, for immediate use, obtain a quantity of soil from any near-by florist or market gardener. A few bushels of soil will fill a good many pots!

**TEMPERATURE.** You know, no matter how little gardening you have done outside, that no plant will grow when it is very cold; that some will grow in early spring or late fall, when it is still "chilly," and that others will thrive only during the warm weather of summer.

Just so, in the glass garden, you will find that, below a certain temperature, nothing will grow; that in a cool temperature some things will thrive; and that to succeed with yet others,

a real "hot" house is needed. But the beginner usually has a lot of needless worries over the "temperature problem." In the outdoor garden you cannot maintain a special temperature for each different bed of flowers. Asters and Tea Roses, Snapdragons and Tuberous Begonias, Lettuce and Butter Beans, grow in all our gardens side by side, or nearly so. Now Asters and Snapdragons and Lettuce are "hardy" or cool-temperature plants; while Tea Roses and Tuberous Begonias and Beans are "tender," or warm-temperature plants. Out of doors, one doesn't try to grow Head Lettuce during the heat of midsummer, nor Beans during early spring. In other words, gardening is adjusted to conditions.

It is just the same in the glass garden. If you have a "cool" house and a "warm" house, or a two-compartment house (and if there be only one house it should have this division), naturally it gives you more of a range than if you have but one general house. Where two houses are available, usually one is run at 45 to 50 degrees (night temperature), and the other at 55 to 60 degrees. But in a single house, run at 50 to 55 degrees, you can grow in a fairly satisfactory way most of the things that can be grown in the two houses. Asters and Roses, Snapdragons and Begonias, Lettuce and Beans,

may all be grown in such a structure. A little less heat for one of these things and a bit more for others would undeniably give conditions more



You can grow dozens of things successfully in the same temperature. The idea, which some folks seem to get, that you need a special house for such things, is all wrong.

nearly ideal; but conditions for outdoor growing are usually short of the ideal. The point is that, in either case, results that are generally satisfactory can reasonably be had even when conditions are not ideal.



With modern standard construction and heating anybody can keep a house at the desired temperature, and temperature troubles may be forgotten if arrangements are made to provide about 50 degrees for a single house, or 45 degrees and 55 degrees if you have two houses. Remember, too, that when greenhouse temperatures are mentioned it is always the night temperature, allowing for an increase of say 10 degrees by sun heat in the daytime.

### *Some Points on Watering*

In gardening outdoors dependence for moisture is mostly on the gentle (or otherwise) dews from heaven, using the hose or some accessory system of overhead watering such as the Skinner system only when the natural method fails to provide adequately.

In the glass garden, on the other hand, watering is wholly under control. This has both advantages and disadvantages, but the former outweigh the latter. Getting enough moisture for the plants is, of course, easy—nothing to do but turn on the water. A thing that has to be learned, however, is the importance of keeping the soil, in pots or benches or beds, *evenly moist* at all times. It might seem a reasonable guess, at first glance, that the best way to do this would

be to water a little every day—not much at a time. But, on the contrary, as a general rule it is better to *water very thoroughly*, so that the soil is wet clear through, and then withhold water until the soil *begins* to get dry.



Light, moisture, temperature, fresh air. You must keep in mind that these factors, on which the welfare of your plants depends, are all under your control.

Some plants naturally require more water than others—whether indoors or out of doors, but in the glass garden we can go much further in taking care of their idiosyncrasies in this respect. But this doesn't by any means mean a particular watering schedule for each class of plants. Dozens of different kinds will thrive

under practically the same amount of watering.

But the same plants need different amounts of water at different seasons of the year, due partly, of course, to the fact that there is much more evaporation during the long hot days of spring and summer than during the shorter, darker days of fall and winter.

But there is another reason. Plants have a "resting" period. Under normal growth, out of doors, this is during the winter months. If, however, we take such plants inside, and "force" them to bloom, or fruit, out of season, we must let them rest after they have bloomed or fruited. During this resting period, which may be from a few weeks to a number of months in extent, they will require comparatively little water—only a fraction of that needed while they were in active growth, making new wood, blooming and fruiting.

Most of Nature's changes are gradual. In the same way, a gradual change is made in increasing or decreasing the amount of water given to plants under glass. Use common sense in avoiding any sudden change or check, just as you would in the care of animals. If common sense is used, the watering of plants in the glass garden will present no great mystery to the person who has gardened out of doors.

*The Need of Light and Air*

Before the days of modern greenhouse construction there were dark corners and shady strips and places that remained wet from the "drip" from the sash bars. So the practice of putting some plants, and especially seedlings, "near the glass," was recommended by the old practitioners. Plants did better "near the glass"; probably not so much because they were near the glass, as because they were then away from the damp and shade.

The modern glass garden is flooded with light. Little shade is cast by the supporting structure. There is no perpetual "dripping" to contend with. Therefore, the greenhouse builder has solved many of these problems, in advance, for the under-glass gardener of to-day.

But one thing must be avoided: *the overcrowding of plants.*

Most plants need abundant light, and all need air. Plants set too close together, in the soil or in pots, will be weak and spindling and unsatisfactory. Moreover, they are easy prey for every bug and disease that happens along.

Give your plants room. Let them breathe. Let the air get through them. Give them plenty of fresh air. This will not only keep the plants

from shading each other to an injuring extent, but will avoid the conditions that are usually the cause of bugs or disease getting a start; and it will make it possible to control them effectually if they do put in an appearance.



The same general principles which you use successfully outdoors apply to the indoor garden.

So, even to the beginner at under-glass gardening I would say there are no dragons in the way. You can succeed here as surely and as quickly as you have succeeded with your outdoor gardening. With a working knowledge of plants and of plant growth, a love for plants, and a

modern glass garden, you have a world of fun before you!

*The one Recreation that Never Goes Stale*

We all feel the hankering for gardening. That's why you'll find the old, stoop-shouldered, gnarled-fingered mill-hand, after his day's work, out on his little patch of ground, knee deep in his garden. And up on the hill, far above the smoking factories, where the big white mansion is, if you go out through the formal garden and tiptoe on the edge of the turf you will surprise the lady of the house in her own private patch which the gardener does not dare touch. You will find her there, spending *her* little hour back in Eden—her hurried, snatched little hour away from the nerve-fraying toil of formal idleness and all the irks and confinements of "keeping up."

Yes, the Colonel's lady and Judy O'Grady have the same need of their Geraniums and Heliotropes and Roses. Here is one recreation for both—and for all of us—that never "grows stale"; that one never has to change from because it is always changing itself. A recreation that renews one's vigor and one's vision at the same time; that sweeps the cobwebs out of the brain cells and lets in a flood of sunshine through the attic windows of the soul, where mellow old

things are stored, things that it does us good to look at and ponder over once in a while.

Truly, there is no other life-builder quite like gardening. "But," you say, "we have our gardens but a few months of the long year. During the long pull of winter, when we need them most, they are not." But you can have them from January to December! The feeling, the spirit, the very essence of your favorite secluded garden nook you can have within the crystal case of a glass garden of your own! The same sense of quietude, of shelter, of disassociation from the hurry-worries of workaday routine are there—the seclusion that lets you let down the bars of your own mind.



Here, in a quiet garden nook, you can loaf and invite your soul.

*A Glass Garden without "Marring the Architecture"*

How little play time we give our thoughts!  
How easy to lose the fine sense of proportion we

had when we were youngsters. We give more time to some unimportant detail of a new coat than to getting out for an afternoon tramp and bringing back an armful of Bayberries or Bittersweet, to add a note of cheer to the living room for a twelve-month. We worry more over the architectural harmony of our houses than we do over the harmony of our lives.

Would a little glass garden disturb the severe simplicity which we so handsomely paid our architect to achieve? Then, shall we admit that it is not to be considered? Shall we give in to such architectural mandates, no matter if our vision may be beginning to get warped and our gray matter grown a little mouldy, for want of that soul-refreshing touch which only mellow sunshine and green growing things can give?



It is but a step from the gardening you've been doing outside to success in gardening inside. Come in and see for yourself.



But happily for us all the day of even such a trivial objection as "marring the architecture" is past; for the modern greenhouse, small or large, can be so perfectly harmonized, so smoothly moulded into the picture, that it becomes an added charm, even architecturally.

All of which but makes another reason why more and more of us should learn to realize that gardens are no longer dependent upon seasons, climate, and weather; that they may be enjoyed at will—any time, any where.

## CHAPTER II

### REBUILDING THE GARDEN OF EDEN

WHAT is *your* idea of Eden? If you had to write a description of it, you would find yourself, at the end adding a list of your favorite flowers—and, of course, some fruits. You might omit the apple; but peaches, and their blushing cousins the nectarines; pears; and “the grape, that can with logic absolute, and two-and-seventy jarring sects confute”—for these, you would surely provide!

It doesn't necessarily take a “range” of greenhouses, with an imported gardener and an expensive corps of assistants, to do all of this. The fact is, you can grow a wide range of things in a single house; and in one house with a glass partition a surpassingly large variety may be grown.

The first greenhouse I ever had was 15 feet wide and 20 feet long. I cut the logs from which the sashes were sawed, took them to the sawmill and then to the planing mill myself. The glass was obtained from old photographers' plates

with the emulsion washed off. The house was heated with an air-tight stove and a tile flue.

Now I am not suggesting that you experiment with any such makeshift house as that—it is too expensive, aside from any other consideration.

That house went to pieces in five years, while a modern standard construction house will last nobody knows how many joy-filled years.

But when I could crawl into that little sunshine shanty, and take off my sheepskin



The first greenhouse I ever owned was only 15 feet wide and 20 feet long. That little sunshine shanty showed me the real joys of gardening.

coat; and smell the Geraniums, and see their first bright flowers opening; and watch the Cabbage plants stretching their broad little leaves to get every ray; and feel the genial sunshine hitting the back of my neck, and filtering down the full length of my spine—then I knew that before I had become the owner of a greenhouse I had never known the keenest joys of gardening! When I looked out through that fraction-of-an-inch crystal sheet that separated my tiny, cozy,

fragrant Eden-spot from the snow-filled world, sparkling cold even in the noon sun, then I marvelled how any one who loved flowers, the touch of plants, and the fragrance of fresh earth could get along without an all-year-round garden.

And I wonder yet.

### *What I Grew in My First Greenhouse*

In that little "two-by-four" glass garden I grew—about everything, I was going to say. But of course I didn't have American Beauty Roses, Farleyense Ferns, nor Orchids; but I did have Geraniums, Heliotrope, Daisies, and a dozen varieties of Begonia. Then there were Carnations in pots, several kinds of Ferns, some of the hardier Palms; a few good old-fashioned Fuchsias; a big Flowering Maple acquired at an auction sale; and a Lemon tree that the scale got the best of because I didn't know what to do for it. There was Lantana, of repelling odor, but kept for its cheery little rosettes of color; Tradescantia, that took possession of all the ground under the benches. German Ivy that wanted to run all over the place, smothering everything else. Asparagus plumosus, with its wonderful green lacery; Oxalis and Ice Plant blooming their heads off in the hanging baskets

they dangled from; a Cactus that blossomed regularly for Memorial Day, and an old Amaryllis.

These, and a good many other good things.

Vegetable plants, too, I started here—Cabbage, Cauliflower, Beets, Lettuce, Onion (easiest thing in the world to start early, and enable you to get those whacking big bulbs such as you see in the Fall Exhibitions), Celery, Peppers, Eggplants, Cucumbers, and Melons.



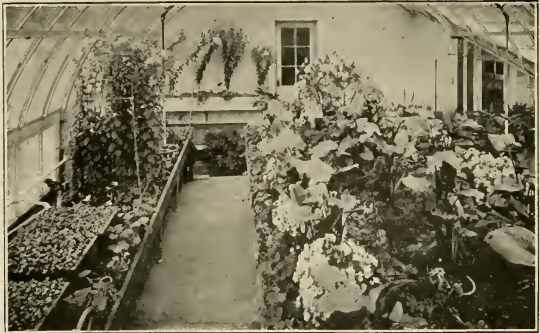
Greenhouse or cold-frame grown Onions with tops cut back for transplanting in the garden. It not only gives quick growth but the Onions will be much larger.

Incidentally, I sold enough plants (after using all I needed myself) to pay back all the cash I had put into the proposition.

But I have something more interesting to tell you about than all of these.

### *A big Discovery in a little Greenhouse*

The first spring I had that little house I made a big discovery; but I never discovered it was a discovery until years later, when I realized how restricted a list of flowers is always recommended for "greenhouse culture."



An astonishingly wide range of things can be grown in a single small house. Imagine, for instance, what *you* could do with one like this.

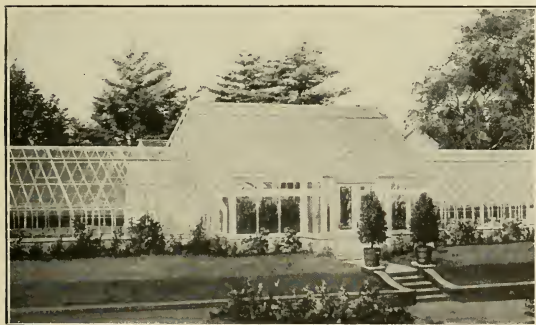
Get away from that “greenhouse culture” restriction—it is the wrong idea. Here is why I say so:

That little greenhouse of mine was built in February. It was made possible then by removing a big pile of manure from the sunny side of a shed. The manure had kept the ground from freezing, so we were able to dig post holes and get some soil to start growing things in.

Now, had I ever before worked in a greenhouse, undoubtedly it would not have occurred to me to try so many things. It wasn't orthodox! But just as soon as the ground began to

thaw in the spring, I dug up about everything diggable, and put a sample of each in that little sun-shanty to see what would happen: Rhubarb and Asparagus; Strawberries from the garden; Hardy Roses; clumps of Lily-of-the-Valley; Hardy Pinks; Iris; Phlox; Violets; Peonies; even things from the woods, such as wild Columbine, Crane's-bill, and Bloodroot.

That, of course, wasn't orthodox greenhouse procedure, but no one had ever told me any better! Apparently the things I lugged into my little garden early that spring didn't know any better, either. For they all started to grow, just



Think of your greenhouse, not as a greenhouse, where you should grow "greenhouse" crops, but just as a glassed-in garden where you can grow your own favorite things—flowers, plants, or vegetables—any time of the year.



Don't confine yourself to the regulation greenhouse flowers. Grow your favorite—Nasturtiums, Daisies, anything you like.

as they would a month or so later out of doors. With the exception of one or two, whose root systems had been too badly disturbed in the process of taking up, everything flowered as cheerily and freely as if it had never been changed.

So this little experience coupled with things I have since done, or seen done, has made it very clear to me that the usual conception of a greenhouse and its possibilities is a falsely restricted conception.

Don't think of it as a greenhouse! Think of it as a protected garden, where you can have



your favorite flowers—flowers that will not grow outdoors in your climate; vines, shrubs, and perennials; anything you want at most any time you want it.

Think of your glass garden, not alone as a place to grow these things in for cutting, but as a storehouse from which to keep the living room fresh and fragrant with living plants in a way no cut flowers can keep it.

Think of your glass garden as a garden of your own where you may have the pleasure of gathering blooms you have grown with your own hands. What a pleasure to be able to send such personal messengers of cheer to some sick or sorrowing acquaintance; with your card to say:

“Gathered these this morning, just for *you*, in my own glass garden.”

Think of your crystal garden as a place to live in, to relax in, to play in; where you can come to know your flower friends



In the glass garden you learn to know your flower friends even more intimately than you ever know them outside.



And even  
in a small  
house you  
can grow  
some fruit.  
The plants, in  
tubs, are out  
of the green-  
house the  
greater part  
of the year.

even more intimately than you have ever known them in your out-of-doors garden.

For instance, take the matter of——! But no! That will have to wait. It is near the middle of the afternoon now, and I have six trees of Apples, nice sun-reddened Baldwins, waiting to be picked, so that will have to go over to the next chapter.

Do you know of anything that gives as much fun as gathering the fruit you have watched, sprayed, and tended, through the blossoming of spring and the growth of summer? Well, there *is* one thing to equal it and if you have ever watched fruit trees in tubs under glass slowly awaken into life and burst into a mantle of bloom while all outside is still wintry, you know what it is.

## CHAPTER III

### YOU DECIDE ON A GREENHOUSE: THE FUN BEGINS

THAT first little greenhouse that I have been telling about did not do for very long. It was "crowded to the gunwales" the first spring, indeed. I didn't know what under the sun we should do with all the plants when fall came again, because they never would go back into that little house—I could see that! And I wouldn't consider leaving any of them to the icy-fingered mercy of old General Jack Frost.

I certainly did a lot of worrying about it, but the plants didn't—they just went on growing and blooming and helping to make life more joyful for every one who came in sight of them. Even when the rain fell not, and moisture was gone from the soil, they put on more blooms!

But before the nights were frosty, the frost was provided against. The owner of the neighboring place drove into my yard one August day and wanted to know if I would like to rent his place. A friend of his who had it was leaving and he didn't want the greenhouse that was on it un-

occupied. I thought of all my plants. So I took it.

But here was a problem. My house was 15 x 20 feet, which equaled 300 square feet of "flower space." The new house was 80 x 22, or 1,760 square feet; and a run of frames the entire length outside besides, which brings us to the subject of this chapter; for as soon as you decide on a greenhouse the fun begins. At least, mine did.

### *Getting the Plants in Advance*

Here it was the middle of August and 1,760 square feet of greenhouse space to fill, and I without any knowledge of what to get and the necessity of making that house pay its way.

Luckily, the man who was working for me was not quite ignorant of greenhouse work. In fact, he had had considerable experience on that very place. But that wasn't all! He was one of those natural-born plant hypnotizers—the kind that can stick a dead twig upside down in the ground, and when you're not looking will say some mysterious formula over it and have it sprouting green in a fortnight. You have met that sort? So far as I have ever been able to solve the mystery, it is just a love of growing things, so strong that it outbalances gravity, and

pulls the beauty that is in all the common earth at our feet right up into leaf and flower, color and perfume. Weird, maybe, but what a lot of that brand of weirdness the world could stand!

Well, to get back to those 1,760 feet! When we had cleaned it out, and all the old pots and dead plants picked up, it did look as big as the inside of a barn—bigger, indeed—big as an armory, in fact.

We had six weeks in which to get ready to fill it before we took possession, which is much the same situation you will surely have while waiting for your house to be put up and turned over to you, with the heat turned on. It always happens that way!

### *Preparing the Filling for the Glass Garden*

Here's how we did it. I am telling this, not so much to show that it is not an expensive matter to "stock" a greenhouse, as to give an idea of how one may go about having the wonderful fun of filling the glass garden, almost with one's own hands, right at the start.

From what we did, the reader can see what another can do—always keeping in mind that the greenhouse is a garden wherein can be had what you will (within reason), when you will, and how you will.

First of all, I went to a neighboring town, and spent the day visiting the several greenhouse establishments there, and still, looking back upon that occasion as one of the big days in my life,



By starting in advance, you can have scores of plants, half grown and in bloom, ready to put on the benches the minute your house is completed.

wonder why everybody does not want to be in the greenhouse business.

The thing that did surprise me, however, was the fact that the greenhouses did not grow more kinds of flowers. There would be whole houses of Carnations, or Roses, or Lilies, without another kind of plant. And most of the little old-fashioned kinds of plants that I wanted, the growers didn't bother with!

But at last I ran across an old-fashioned, more or less antiquated place that came nearer my idea of what a greenhouse ought to be. Old vines, some of which had evidently been growing there for years, covered the north walls. There were shelves and hanging baskets; things tucked away under the sunny sides of the benches—dozens of different kinds of things. In some places there were little narrow walks one had to squeeze through sidewise to avoid brushing the vines that hung down from the benches; and doors you had to stoop to get under. Horribly inefficient, undoubtedly, compared to those modern light, airy, open ranges I had been through; but what a place to spend one's days in! Surely, eating one's bread in the sweat of one's brow would not be a severe life sentence here!

From the old fellow who owned this place, with an accent as strong as his pipe, and speech as knobbly as his knuckles, I secured just the kind of an assortment of plants I wanted. He took as much interest in my new venture as though he were a long-lost uncle, and put in extra things—cuttings of this and that; gave me minute instructions about the idiosyncrasies of each; warned me against coddling them too much; and made a final urge to come again soon and spend the day.

Of course, this old enthusiast was not making the money that his more up-to-date competitors did; but I wondered if he wasn't getting more out of his greenhouses.

### *How We Made a Start—From Seeds and Cuttings*

Arriving home, I found that Pat had rigged up a couple of frames in my absence—regular 3 x 6 feet size, such as can readily be made by any one out of a few boards; or may be bought ready-made, ready to go together in a jiffy, with the handy corner cleats that bolt them together.

One of these frames we filled with sand, for starting cuttings. (You want to know what kind of sand and how much soil; and mayhap, what a "cutting" is? Of all that, in good time.) For the present let us consider what can be done—starting with nothing, a few weeks' time, and some enthusiasm.

From seed we started: Lettuce plants, to have ready for setting out under glass; a few Beets, just enough for an experiment, for our own use; the following flowers—one small packet of seed of each, in most cases—Begonias, several sorts, so we could have our pick of the most attractive varieties; Heliotrope—the same way; Petunias, Ageratum, "Irish" Daisies, as Patrick insisted on calling them, because they grow wild in that



wild little Island—though the catalogues call them *Bellis perennis* or “English” Daisies. Then there were Candytuft, Lobelia, Stocks, and Mignonette for cut flowers—and for fragrance.



So the next step, once you've decided on a glass garden, is to start things to go into it—flowers for cutting, plants for winter and spring, and vegetables.

Just for my own amusement, some Forget-me-nots, *Portulaca*, some Pansies, to bloom in the winter, and *Salpiglossis* (the latter not for its name, but because I had read about it in a magazine), and wanted to see what that wonderful “velvety texture” was like.

*All in one Frame*

“All these in one frame,” do you say? “Yes, Ma'am. In the other frame we put cuttings of

all the plants I already had from my little 15 x 20 foot greenhouse; such as Geraniums, Begonias, and Ice Plant" (*Mesembryanthemum* it is called in the catalog). Right here let me remark that if the seedsmen's business could be killed by names, it would have been buried long ago. And all others mentioned in the last chapter.

Did you ever grow plants from cuttings? If not, you may find some helpful suggestions in the next few pages. We pretty much cut to pieces all the new plants I had bought, to get all the cuttings we could from them.

Of course, all of these are simple little things—for some of them you may not care at all; but the point is, you can begin to have your fun choosing the things you want, selecting them, growing them yourself, if you like, as soon as you know you are going to have a winter garden.

As you will see, with the aid of frames you can have a whole garden full of things ready to go into your glass garden the moment the roof is on.

## CHAPTER IV

### HOW TO SUCCEED WITH SEEDS

CREATING a thing is always a more joy-giving achievement than merely possessing it. To get all the fun there is in glass gardening, of course, it is essential to know how to grow your own plants, as well as to take care of them.

To be skillful at the art of starting plants from seed is to know the pleasure of feeling that you can add at will to the variety or the amount of the things in your glass garden.

Fortunately, when I had the problem of filling the suddenly acquired greenhouse, I had had some past experience in starting plants from seed to fall back on. But I soon found that there was a lot more to learn.

What I learned from experience I wish, so far as possible, to save another beginner from having to experiment over. So in this chapter we are going into details.

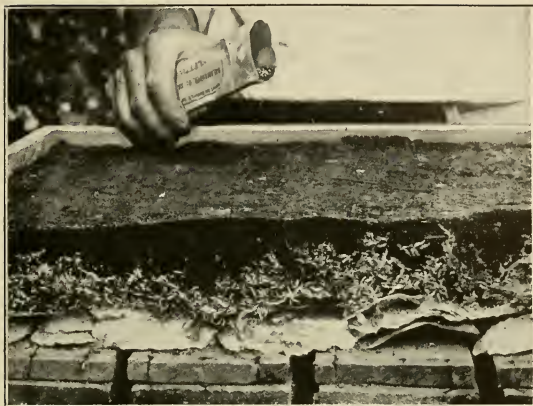
*The First Thing Is the Importance of the "Make Ready"*

The first thing I learned was that the most important part of the work of growing plants from seed is done before you touch the seed. It is in the "make ready" that success or failure lies in nine cases out of ten.

Now, a seed is one of the most wonderful pieces of mechanism ever devised. Compared to a seed, the most ingenuous time-bomb ever put together is a crude, clumsy affair. Think of it! In a spherical shell, so small in many cases as to be almost microscopical, is stored material which is capable of exploding the shell when the proper conditions arise, a week, a month, or years later; and not merely that, but also of feeding the delicate living organism produced until it can support itself, in its own wonderful way, from the soil.

So, when you stop to think of it, the wonder is not that there are some failures in getting seeds to grow, but that there are any successes. The mere physical feat performed by the tiny sprout in forcing its way up through what, in comparison to its size, is a gigantic layer of stones and soil, should make it obvious that only favorable conditions can bring success.

The favorable conditions, of course, are mois-



A seed "flat" prepared for seed sowing. (Side removed to show cross-section.) First, a layer of rough material—oyster shells, broken pots, or coarse screenings. Next, sphagnum moss. And, on top, finely sifted, light soil.

ture and temperature in the right degree, and an abundance of light.

With a modern greenhouse, where the abundance of light and the temperature are readily controlled, the thing one must take most pains in providing is the right moisture conditions. To do that it is necessary to provide soil that is light and spongy; soil that will not make a crust. *Ordinary garden soil is absolutely unsuited for the starting of fine seeds. To insure success, make up (compost) a soil especially for the purpose.*

*Starting Right, with the Right Soil*

In making our start, therefore, we went out into the woods and got several big burlap bags full of leaf mold. This we found along an old stone wall where the leaves had piled up and rotted year after year. We rubbed this through a wire screen of one-quarter-inch mesh. An ordinary coal sieve will answer every purpose for small quantities. This gave a fine, light, woody-smelling material that it was a pleasure to take up by the handful and let run through one's fingers. Then from a flower bed we got a quantity of rich mellow soil, that had had lots of manure dug into it in the previous spring. That was sifted, to eliminate any pebbles, and the two products were mixed together in proportion of about one part of soil to two parts, by bulk, of the leaf mold.

The result of all this was a nice, light, smooth-feeling soil that you would know instinctively was ideal for the little seeds to sprout and grow in.

Now, a soil like this will let any surplus water drain through it immediately, and yet it will absorb enough moisture to stay moist a long time before it is necessary to water it again. Furthermore, the surface will never form a crust, such as

ordinary soil forms when it gets dry on top, making it impossible for the little seedlings to break through. The beauty of it is you can prepare as much of this mixture as you want at one time and store it away in a barrel or bin for future use. A six months' or year's supply can be made in a few hours.

Maybe you are not fortunate enough to be where you can get out into the fragrant woods to gather your own leaf mould. Of course, you can easily bring home a bagful or two in the car, or you can get cocoanut fibre at the nearest florist or seed store, to use in place of leaf mould. Commercial "Prepared Humus" is also very good.

### *Preparing the Soil for Sowing*

Having provided the bedclothes, the next thing, of course, is to make up the bed. The soil may be put right into a frame or in a bench in the greenhouse. But there are several advantages in using "flats." The work can be done more conveniently; each individual lot of seeds can be watched and controlled more readily; and when the little plants are big enough to put into other flats, the work can be done at leisure on a bench of convenient height, in a comfortable place.

There is nothing mysterious about a "flat." It is merely a light box of convenient size and two to three inches deep—two inches being enough for starting most seeds, while three inches is better for transplanting and for cuttings. An



"Seed pans" are the things to start small seeds in. Have an assortment of sizes on hand.

easy way to make flats is to get a supply of one-by-two and one-by-three-inch boards for the ends, and use ordinary building lath for the sides and bottom. Put on the bottom strips about a quarter of an inch apart to allow for drainage. Or saw wooden cracker boxes into strips and bore holes in the bottom. You will find a few "seed pans" as made by the potteries handy for starting individual varieties in small lots.

To prepare the flat or seed pan for sowing, first put in a layer of the coarse screenings left from the leaf mould when it was rubbed through the sieve or use sphagnum moss. The moss you can gather yourself in most swampy places; or it may be purchased from any florist.



Cover this bottom layer with the prepared soil, filling the box, and pressing well down into the corners and along the sides. Give the soil a thorough watering with a fine spray; or better still place the flat or seed pan in a tray or basin so that it may soak up the water from the bottom until the moisture appears on the surface. This is better than watering, because it gives the soil a chance to absorb absolutely all the moisture it will hold without getting the surface wet.

### *Sowing the Seed*

Open the packages carefully, for some seed, such as Begonia, is so fine that a breath will blow it away. These very fine seeds should be merely dusted on the surface and pressed lightly into the soil with a small block of wood. Shreds of sphagnum moss may be laid on the surface to keep the little seeds shaded and moist, or they may be placed in a rather dark place until the seeds begin to sprout. Very careful watch must be kept, however, for they need full light from the moment they begin to come through the soil.

For slightly larger seeds, such as can be taken between the thumb and finger and scattered in the row, mark off with the point of a lead pencil little lines in the surface of the soil, two or three

inches apart and as shallow as you can get them—just deep enough for the seed to drop into. These should be barely covered by sifting a little soil over them, and gently pressing down the surface. Still larger seeds may be put in and covered to a depth of two or three times their own diameter.

Covering the flat or seed pan with a pane of glass after planting is not always necessary, but the results are so much more certain that it is well worth doing. Leave a little “chink of air” or an opening along one edge. The purpose of the glass is to prevent evaporation while at the same time keeping the surface of the soil around the seed moist. This makes germination surer and quicker.

The temperature in which most seeds should be kept after sowing is from 60 to 65 degrees (at night). The seeds of plants such as Begonia, Heliotrope, and others in the “warm” list as given on page 85, require 10 to 15 degrees higher than this.

Seeds will germinate quicker if given what is called “bottom heat”; that is, if the flats or seed pans may be placed on a bench directly over heating pipes; or they may be placed directly on the pipes, provided proper care is taken not to let them dry out.

*Care of the Seedlings*

Immediately the little seedlings break through the soil they must be given light. They should also get plenty of fresh air. During this period give water with the greatest care, using a fine hose or spray, watering early in the morning on bright days only, so that the leaves and surface of the soil can dry off before night. Better still, use the watering tray previously described. Damping-off is a troublesome disease which may appear at this stage. It causes the sudden wilt and death and rotting of the young plants. For treatment see Chapter IX. If the little seedlings come up so thick that they begin to crowd right at the start, don't hesitate to thin them out; remembering that a couple of dozen good plants are far better than a hundred or more



It is important to transplant the seedlings immediately when they are ready. Those at the left (above) have been left too long. Those at right are barely big enough. But (see next illustration)——

that are good for nothing. Overcrowding is one of the most frequent causes of failure in plant growing both outdoors and indoors.

In from three to six weeks the little seedlings will be big enough for transplanting. They are transferred from the seed box to other flats or to small pots; or, in some instances, directly to the benches where they are to be grown. In most cases flats should be used for this first transplanting.



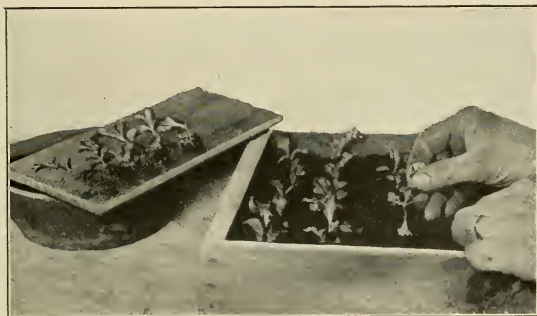
These are "just right"—the second true leaf showing, and the roots still short enough, so they all come out with the plant.

### *The Art of Transplanting*

A flat prepared for transplanting differs somewhat from one for seed sowing, a layer of well-rotted sifted manure being put in the bottom in place of screenings or sphagnum moss when sowing seeds. A little manure also may be mixed with the soil, which otherwise should be the same as used for starting the seed, except that the proportion of soil to the leaf mould may also be greater.

Several hours before transplanting give the seedlings a thorough watering. This will leave

the soil moist enough to allow the tender little roots to come out readily, and dry enough to handle without being sticky and mussy. When ready to begin take out one or two of the little plants at a time, using a flat pointed stick or a transplanting fork, and spread out on a piece of



Holding the top of the seedling gently between the thumb and forefinger, you lower the roots down into the hole, and then press the soil firmly about it.

glass or a shingle so that they can be picked up readily.

In transplanting, most seedlings should be set considerably deeper than they were growing, usually almost up to the two seed-leaves. Make a hole in the loose, moist soil with your finger tip, or a small wooden dibble or pointed stick if you prefer—and, holding the little plant gently

by the top, lower it into position and press the soil firmly about it with tips of the thumbs and the forefingers.



Flat of Lettuce showing distance apart for the plants

Practice will enable you to do the work quickly and neatly. The little plants when

set should stand up stiffly and be firm in the soil. Don't be afraid to put them in deep and press the soil firm. If after transplanting they wilt like a fat man's high collar on a hot day, something is wrong with your method.

Immediately after transplanting, give a thorough watering, using a very fine spray so as not to knock over the little seedlings; or, better still, use the method for watering from the bottom, already described.



Lettuce in a seed flat that has been plunged in a pan of water after transplanting so it will be absorbed from the bottom without disturbing the plants or packing the soil.

Keep the newly set seedlings shaded from the sun for several days, but do not water again until the soil really needs it. If it is hot and the plants show a tendency to wilt, a very light sprin-

klings, or a syringing of the leaves, will help keep them fresh.

In three or four days the plants should be "established." From then on give them plenty of fresh air and general good care.

## CHAPTER V

### THE MAGIC TOUCH

IF I were worth many millions, and had seventeen greenhouses, I wouldn't let my gardener have the fun of doing all the "propagating."

Have you ever tried it? Have you ever selected a plant, maybe a special shade of color,



The Magic Touch

or a brand-new seedling discovered in your own garden, and set about making new plants from that one specimen? Knowing that if you failed, it would perish forever from the earth? Knowing that if you were successful you could have dozens, scores,

hundreds, if you wanted, of that particular flower to fill your garden, and give away to your friends? Something individual, personal, your own creation, that they could get nowhere else in all the world?

Now, in the minds of many folks, the art of propagating plants is looked upon as more or less



of a mystery; a sort of a "black art" that has hung over from the Middle Ages; that only those in the magic circle are entitled to acquire, as the result of a lifetime of patient practice.

Don't you believe any such thing! If you have been successful with your flowers and vegetables outside, so that you know in general what plants need to keep them happy and contented, you can be successful with under-glass propagation of a great variety of flowers the first time you try.

How to do all this may be learned from the following pages alone. But, better yet, if there is a greenhouse near you, where you can get the owner or the gardener to show you how to handle cuttings and plants from seed, take advantage of the opportunity.

The best way to see how to do a thing is to see how it is done. There's no argument about that!

Well, to start at the beginning, I don't know of any better way than to tell about what we did in getting ready to fill that empty house. I had never had much experience making plants from plants up till then. I never found any work more fascinating; and since then, though I have made many thousands, the fascination remains as great as ever. Just what there is about it that so fascinates I really do not know, but somehow it seems as though one could pat

oneself on the back for a more intimate share in the partnership with Nature than is the case when raising plants from seeds. Anyway, here is how to go about it.

All the cuttings made that fall—like most of those the reader will have to make in growing his own plants—were what are called “soft-wood” cuttings. That is, they are taken from the soft, immature growth of the plants instead of from the old, hard parts.

### *How to Make the Cuttings*

To test whether the condition of the “wood” is right for making a soft-wood cutting, bend it between the thumb and finger. If it “snaps,” like a butter-bean in prime condition for table use, it is all right; if it bends and doubles without breaking, it is too old and tough; or, in the case of the new growth, too soft and watery.

The cutting—sometimes called a “slip”—may be anywhere from an inch and a half to several inches long. Usually the cutting is made just at or below a joint, but this is not necessary with all kinds of plants. Use a sharp knife to make the cuttings so as to have a clean, smooth edge. The cut usually is slightly slanting. Remove all the lower leaves, and cut back the upper leaves about a half to two thirds.

These cuttings are inserted in pure, plain sand to root; the sand being in seed pans, in flats, or in a bench in the greenhouse. If the greenhouse bench be selected it is usually one directly over



Each little piece, or "cutting," from the parent plant will grow into a full-sized new plant. The lower leaves are removed, and the largest of those remaining are cut back.

heating pipes, as the cuttings will root much more rapidly with "bottom heat." The sand should be at least three inches in depth, and remember that good drainage is just as essential as in preparing for the planting of seed.

Someone told me that I had to have pure "river sand," and I went to considerable trouble to get it; since then have learned, in traveling around, that brown, red, yellow, or "silver" sand



After the cuttings are inserted in the sand they should preferably be put where they will get "bottom heat"—on a shelf or a bench directly over heating pipes.

will do just as well. The color makes no difference; the necessity is that it be "sharp," not water worn. All you need is clear, gritty sand, free from dirt and fine enough to pack snugly around the cuttings and hold them upright, but

not so fine as to run together and exclude the air, like sea sand. Ordinary builders' sand, such as is used for concrete or stucco work, is the thing. Any impurities can be quickly got out by filling a bucket, a pail, or a bushel measure fairly full and then pushing the end of a hose down to the bottom, letting the water overflow at the top to carry off soil and other impurities with it.

### *Rooting the Cuttings*

Cuttings should be put in the sand within a few hours after making; and if they have wilted, soak them in water for an hour or two to freshen. The cuttings may be put in with a dibble or a spike—anything, indeed, to make a hole about the size of the cutting. Or rows may be marked off and cuttings set in as close as they will go without crowding each other. Then give them a thorough watering. Keep shaded for a few days and do not water again until the surface is quite dry. Prevent wilting by syringing several times a day in hot, dry weather, if necessary. If using a frame during the summer, it is well to put a shade over it, a foot or two above it, to allow a free circulation of air.

The cuttings will begin to "strike root" in from fifteen days to several weeks, according to conditions and the kind of plant. Some things

take a very long time to root. If, upon examination, the bottom of the cutting seems to be cal-  
lousing over without showing any sign of decay,



In a few weeks the new roots will start. Don't let them get longer than this before potting.

you may be pretty sure things are going rightly, even if there is a long time before there is any sign of roots.

Once the little roots do start, they grow very rapidly. A common mistake is to let them grow too long before potting. As soon as they are about a quarter of an inch long, the cuttings should be taken out and potted up. Their condition may be determined by taking up one or two of the cuttings and examining the ends, replacing them promptly, of course. Use soil same as described for transplanting seedlings, with a little sand added.

### *Pot Them up before the Roots Get Long*

For the first potting, very small pots or "thumb pots" are used; 2 inch for most things; 2½ inches or 3 inches for larger cuttings, such as Geraniums.

In potting up, fill the pot about level full of freshly sifted, loose, moist soil; make a hole in the centre with the forefinger; place the cutting in position, putting it well down to the first pair of leaves and being careful not to break off the little roots. Then hold the two thumbs over the top of the pot to keep the cuttings in position, and rap the bottom of the pot sharply against the bench to pack the soil in the pot. A final extra pressure with the balls of the thumbs may be given if required. The little cutting should be in so firmly that it will not readily pull out.

The pots are usually placed, as they are finished, in a flat, and given a thorough watering. A convenient way is to keep them in the flat for several days, under a bench, or in the potting shed or workroom, so they will be



And first thing you know, while they're still babies, they'll begin blooming like grown-up plants!

shaded. As soon as they seem to be established in the pots, transfer them to a frame or a bench in the greenhouse. These pots are usually "plunged" half their depth in soil or ashes, so as to prevent their being knocked over, and to keep them from drying out too rapidly.

Until new growth begins, water is to be given rather sparingly, just enough to keep the soil fairly moist and the plants from wilting. Once established, these little plants will grow very rapidly. Many things will begin to bloom in these little 2-inch pots!

For general care after growth begins, and directions for re-potting, see Chapter VIII.



## CHAPTER VI

### THE FASCINATING ART OF SOIL BUILDING

WHEN you hold up a Carnation and inhale its spicy fragrance; touch the satin petals of a Rose; or admire the glowing colors of a Tulip—do you ever stop to wonder “whence comes this?”

Out of the earth, the soil, the common dirt at our feet! Of the multitudinous things to be marveled at, do you know of any more strikingly wonderful? Out of the same inert brown soil come the glistening whiteness of a Gardenia, the flaming crimson of a Poinsettia, the pure blue of a Forget-me-not, and all the shades imaginable in between. Each plant (through what process, the most advanced scientist can give no more than a baby’s guess) searching, selecting, rejecting, accepting, what it finds in the soil, building up its own individual pattern of cell tissue, of plant form, of bloom.

“Inert Soil!” That is the stereotyped phrase. Inert? About as inert as the Battle of the Somme!—only it is on a microscopic scale. For

the soil is a medley of chemical explosions, and the terrific warfare of deadly enemies, and the constant labor of sappers and engineers, tearing down and building up continuously!

Now the gardener is, in a sense, the ruler of this invisible empire. In greenhouse work its needs are almost solely in his own hands. And when he understands what things he is responsible for, the fun of growing plants will have a new and fascinating interest. When he understands the routine of mixing soil, and adding manure to it, and providing drainage and all the rest, he cannot but count it as a great adventure.

#### *What Soil Must Be for Plants to Thrive in It*

Now we do not want to enter into a long discourse on the "technical aspects of agricultural bacteriology"—but the gardener will be a better gardener if he knows something about soil. Here are a few essential facts to memorize:

1. That the presence of certain friendly bacteria in the soil is necessary to healthy growth.
2. That these bacteria are discouraged by soil that is too wet, or too dry. They like a 50 per cent. saturation—in other words, a nice, evenly moist soil.
3. To keep the soil evenly moist, it is necessary to have in it a large percentage of spongy, ab-

sorbent material which will soak up water and hold it for a long time.

4. This is supplied by "humus" or decayed vegetable matter. Soils without humus ab-



This gardener looks like a sure-enough scientist. But you don't have to be that to have a lot of fun mixing up your own soil to get just the results you want.

sorb little moisture, and yet get wet and sticky when they are watered, and lumpy and hard when they dry out. Hence the necessity for humus.

5. Too much water is fatal for the bacteria and

for growing plants; but unless the water can quickly run down through the soil when there is too much in it—why, of course, you can't prevent there being too much. Hence the fact that good drainage is essential.

“But,” you ask, “isn't the soil like the weather—must you not take it as it comes?” By no means! You can make your soil what you want it, and making soil is almost as much fun as potting plants, sowing seeds, and cutting flowers. It took me some time to find that out, however. In my first experiences with frames, I simply used the common garden soil I had. But by experimenting in my own little greenhouse, and by visiting others, I began to get an idea of what should be done; and by the time I had my big house, I knew pretty well what should be done, and prepared in advance.

### *The Materials for Soil Building*

The first step was to collect the “materials” needed to build my soil with, as follows: loam, sod, humus, in the form of leaf mould; sand. These I deposited in piles near the greenhouse. In getting ready for a small glass garden it would be a convenience to have a barrellful or two of each put in the work house or in the “potting shed.”

For loam, use by preference the best soil ob-

tainable from the vegetable garden. Or possibly in some pasture will be found a soil better still. I hunted up a place where the wash from the road had accumulated, making a deposit of rich loam, with sand and manure. There was a good thick sod on top of this, which I cut off about three inches thick, and dug up the soil from beneath. Then I dug over the manure pile to find the oldest and *most thoroughly rotted* material I could get there. Horse and cow manure mixed, about half and half, is best. Horse manure alone is light and likely to dry out, but will do if you can't get the ideal mixture. The leaf mould and the sand have already been talked about. In case you can't get sand, finely sifted coal ashes may be used as a substitute.

You may receive the impression from some of your garden reading that it is necessary to mix a special soil for about every separate thing you want to grow. Just add that to your list of things to forget!

### *One Soil for all General Purposes*

A prescription for a soil that will give satisfactory results with most plants is as follows: One third each of rotted sod, sifted leaf mould, and thoroughly decomposed manure. This is the ideal, but is subject to modification. For in-

stance, if rotted sods are hard to get take some good thick turf, cut it up fine, and rub it through the screen, the same as with leaf mould. Again, if the sod is on heavy clay soil, add some sand—10 to 25 per cent. in weight—to “cut” the mixture so that it will be slightly gritty in your fingers.



All this wonderful range of color and form and fragrance—out of the same mother soil! When you come to know what really goes on in the “lifeless” soil, you’ll find it interesting as a story-book.

To get the sod to rot, secure a considerable quantity and pack it up in a compact heap, putting the grassy sides together. The manure can be mixed with it at this time, or added later. If the pile is occasionally watered it will rot down more quickly. After being packed several months, cut it down with a sharp spade, and restock it.

Remember that the soil is the real basis of all your work with growing plants—the keynote to failure or success, and it is really much less work to care for this soil properly, taking the trouble to do it as described above, and making enough to last for a year, than to bother to find the right kind of soil each time a small quantity is needed.

Some plants do well in a particularly light, loamy soil, and others require heavy soil. It is an easy matter to make a heavier soil by adding loam to the mixture described above, or to make a lighter one by adding rotted manure or leaf mould.

Where plants are to be grown in solid benches, good drainage must be provided by first putting in a layer of coal ashes, or gravel. Raised benches, which are most used, are usually made with provision for drainage so that any surplus water can run off, but a shallow layer of some coarse material—inverted sods, for instance, or screened ashes of suitable size—being first put in to keep the soil from washing through the cracks. The proper method for securing good drainage in pots is shown in the illustration on page 114.

## CHAPTER VII

SUCH STUFF AS BLOOMS ARE MADE OF

“I sometimes think that never grows so red  
The Rose as where some buried Cæsar bled:  
That every Hyacinth the garden wears  
Dropt in her lap from some once lovely head.”

THE old singing tent-maker of Persia had discovered some utilization for dead Cæsars before it occurred to Shakespeare that they might be used in chinks to keep the wind away!

It may seem something of a sacrilege to quote that beautiful conception of the Persian poet as an introduction to a chat on the interesting subject of plant food, fertilizers, and manures; but, after all, poetry pertains to anything that goes on in a greenhouse.

In the last chapter we talked about the physical make-up of soil—how it is necessary to get it right to have plants grow right. But in addition to good soil conditions, plants need something more. They need food. What makes plant food? And how do plants eat?



### *How Plants Eat*

Let's take the last question first. Plants, of course, gather their mineral food from the soil, which of course is common knowledge. But do you always bear in mind that the only way they can take up any food is in the form of a *solution*? Absolutely no "solids" are allowed in their diets, and incidentally this is another big reason why it is absolutely essential to have a plentiful supply of moisture present. Without it, therefore, though a soil may be chock full of plant food, the plants will starve to death.

The little plant roots and "root hairs" that you can scarcely see are in reality hollow *tubes* with absorbent sides. They search out the rich soil juices and drink them up. Then by a physical process called "osmosis" and other means, the plant juices, running contrary to all the laws of gravity, supply the topmost twig and leaf with the necessary sustenance.

The reader, of course, knows all about nitrogen, phosphoric acid, and potash, as being the three important plant foods; that it is necessary to have enough lime in the soil to keep it "sweet"; and other "first" principles learned in connection with outside gardening.

So we will take all that for granted, and in-

stead we will just look into the practical needs of the practical grower in a practical way. Speaking from my own experience of a good many years there are a certain few things I would stock up with in starting a new glass garden.

*An Assortment of Plant Foods to Start with*

My greatest reliance I would place in *manure*. I'd be careful to get the very best manure I could find, however. If you are in a place where ordinary manure cannot be obtained readily it will be well to obtain commercial manure in dry, powdered, standardized form, convenient to handle, through your local florist or from a seed house. This manure contains all the plant food that regular barnyard manure contains, excepting, of course, the humus.

Commercial humus, however, can be bought by the bag, and, when mixed with the dried rotted yard manure, makes an excellent substitute for well-rotted yard manure, and is very much more convenient to handle. Manure alone is a "complete" plant food because it contains the different kinds of minerals needed, and *also* humus.

But in addition to manure it is well to have other things for some special purposes. The most important of these is:

**BONE MEAL.**—For a small greenhouse, say 18 by 25 feet, a supply of 50 pounds of very fine ground bone, or flour, and a like amount of coarse ground bone, will do for a start. The



To maintain healthy and vigorous growth and have perfect blooms, your plants, of course, need plenty of food. So you must know what they eat.

“flour” is used where quick results are wanted, such as mixing with soil for potting cuttings and the like. A half pint to a pint to a bushel of soil is plenty to use. If this can be mixed with the soil a week or two in advance of using, it will be better; but it may be added at the time of using the soil without any danger to the plants,

since it will not burn the roots as many complete mixed fertilizers are likely to do. The coarse ground bone is used in solid beds, in making composts, and wherever there is no special necessity for *quick* results.

NITRATE OF SODA is the next necessity. This looks and tastes like common coarse salt, is very soluble, and is the quickest acting fertilizer known. You can, literally, see the results from an application of nitrate of soda in twenty-four hours! It is so stimulating, it should be used with great care. The first time I ever used it was on some Lettuce under glass, and I sprinkled it on generously, like any ordinary fertilizer, not knowing any better. A few lumps of it were left by a climbing Rose which had been in possession of that spot for a number of years. Then we gave everything a generous watering. Result: In about four days the Lettuce had turned up its toes. And within a week that old Rose, with a stem of an inch and a half in diameter, was dead.

I have known other people who, having similar experiences with nitrate of soda, blamed the nitrate of soda, and refused to use it as being dangerous. They might as well refuse to use kerosene because some people don't know any better than to throw it on a lighted stove!

Rightly used, nitrate of soda is absolutely safe, and gives such wonderful results that no gardener will want to be without it. A perfectly safe way to use it is to dissolve a tablespoonful in hot water and stir this into a ten- or twelve-quart watering can. Apply it about the roots *after* watering.

On crops grown in solid benches nitrate of soda may be applied as is to the surface, using, however, only the equivalent of a pinch to each plant. Twenty-five pounds of nitrate of soda will be in keeping with the quantity of bone suggested above.

**TANKAGE.**—Another material which I have found so useful that I always like to have it on hand is tankage. This also is rich in nitrogen, but is not quite as quick-acting as nitrate of soda and is more evenly balanced in plant foods. It is excellent for mixing with potting soil. Say 50 pounds of this.

**DRIED BLOOD** is quite similar to and may be used in place of tankage.

**GUANO** is better than either, but is not always easy to get, so put in a stock of 100 pounds of guano—it keeps well.

Either of these materials, or both, mixed half and half, may be added to the potting soil, or as a fertilizer on solid beds, and will give the kind of

strong, vigorous plant growth seen in commercial establishments.

If you burn any wood save the *Wood Ashes* for use, keeping them where they cannot get wet. They furnish both potash and lime, and put the soil in excellent condition. They help make a firm-wooded, normal growth, correcting the tendency toward too much leaf growth which sometimes results from the use of manure and particularly of nitrate of soda alone. If plants are growing strong, but do not bloom, wood ashes will help them.

There are a number of special commercial plant-food preparations which are convenient for use on a very small scale and may be used to supplement the things described above. As a general ready-made fertilizer for greenhouse work I can recommend the Greenhouse Grower mixture of the Nitrate Agencies Co. of New York.

## CHAPTER VIII

### KEEPING YOUR PLANTS HALE AND HEARTY

WHY do plants go wrong? In nine cases out of ten it is not just because you haven't a special house you can devote to that particular thing, and an imported gardener who is an expert in growing it. Nor any of the other causes you may think of, or your friends suggest. Mostly plants go wrong because they are not given common-sense care. Just the common-sense, every-day things that keep plants hale and happy are not attended to. Forget to feed the baby, or the cat, and you are soon audibly reminded of it; if you don't keep the oven warm enough the effect is realized when you look at the cake!

But the occupants of your glass garden, if they are neglected, have to suffer in silence. The result of the neglect which may be going on is invisible for days, weeks, or months; and by the time it does become obvious it is in many cases too late to remedy it.

No, it is not enough merely to know your

plants, to enjoy and admire them, and to fondle them as it were on a bright, sunny morning. You must know them enough to love them intimately, and realize the significance there may be in a drooping leaf, the lack of new growth, or an undersized flower.

Of course, certain plants will pine away and die under the conditions that suit other plants. We speak of "cool-house plants," "hothouse plants," and the like—but there are many things that can be grown in a single general-purpose house, as I have already intimated. At the end of this chapter you will find a list of plants for different temperatures, and besides these there are books and many dealers' catalogues (if you happen to be buying something that is not mentioned in this book) that indicate the temperature required by particular plants.

### *Things to Think of*

Other things which you have to consider are: Light, temperature, moisture, and fresh air. In houses of modern construction the factor of light is well taken care of, and needs no special consideration here. There may also be a corner next to the potting shed or under a bench where plants requiring partial shade may find a congenial place to grow.



TEMPERATURE, of course, is the factor which will require most constant attention, as the conditions affecting it change not only from day to



A turn or two of the little wheel, and your glass garden is flooded with fresh air—as much or as little as may be required.

day, but even from hour to hour. Here, again, as with most other things connected with the growing of plants, you can apply common sense. You know that the thing above all others to be avoided in taking care of the baby is a sudden change in temperature; the same thing applies to your plants. It is not the low or high temperature itself, but the shock

of a sudden change which usually does the damage. That is why it is so essential to have a good, sturdy, well-constructed house which is tight, and in which the heating system is not only adequate in size, *but made for greenhouse heating*. Further reference to this subject is found in Chapter XV.

Temperature is controlled by the heating and ventilating systems, both of which are simple enough. The big difference between greenhouse

heating and dwelling-house heating is that heat is wanted in the former most during the night, whereas it is during the day or early evening that the home is kept warmer. Furthermore, the glass garden gets most of its daytime heat from the sun, and the greenhouse begins to cool off very rapidly when the sun goes down. It is then necessary to get the fire in good condition, and the water or steam circulating *in time to prevent* a sudden drop in the temperature.

The time for opening up the greenhouse to ventilate is when the temperature inside is *rising*; therefore, as a general rule, it is best to ventilate as the sun begins to gain strength early in the morning. This helps to prevent too sudden a rise in temperature, which is just as bad as a sudden drop. A little experience and watching the thermometers will soon enable you to judge easily just when and how much heat or ventilation will be required to keep the temperature running steadily, and indeed is the only way to acquire the knowledge.

By far the greater number of ornamental plants and vegetables will do well with an "intermediate" temperature—*i. e.*, night temperature of 45 to 55 degrees, and a day temperature of 10 degrees or so higher. The "cool-house"

plants will like about 10 degrees below these figures; and the "hothouse" plants about 15 degrees higher. In a single-compartment house aim to keep the air inside as near as practicable from 50 to 55 degrees, night temperature.

*Keep the Air Moist*

MOISTURE.—The great importance of moisture in the soil has already been spoken of; almost equally important is having moisture in the air. Lack of this is why most people have such "hard luck" with plants in the dwelling house. They feed them, they pet them, try to coax them along—but it is all to no avail when the air has had most of the moisture burned out of it by artificial heating. The reason you yourself so enjoy to step into a modern greenhouse and find yourself stopping at the door to fill your lungs chock full of the air you find there is that the moisture in it makes it good to get. It seems almost incredible, but it is nevertheless true, that thousands of people, even in the best of houses, live during the winter months in rooms shut up so tight and so devitalized that plants cannot live in them.

Ventilation, of course, helps to keep the spent air of the greenhouse replaced by air from outside that is normally moist, and in addition the

gardener has the hose and the watering can as moisture-control apparatus.

When I first began growing things in the greenhouse, I found myself tempted to give them a little sprinkling every day, but from my own experience and the advice of older gardeners I soon learned that the one thing about watering is: Don't water until you have to; and then *water!* I do not mean by this that you should let your plants go until the soil is dried out and hard, and the leaves are beginning to droop. On the contrary, a careful watch should be kept at all times, and watering done before the soil begins to get really dry—usually just as it has *begun* to get dry *on the surface*. Then, water to the saturation point; but don't flood things so as to make a muddy mess.

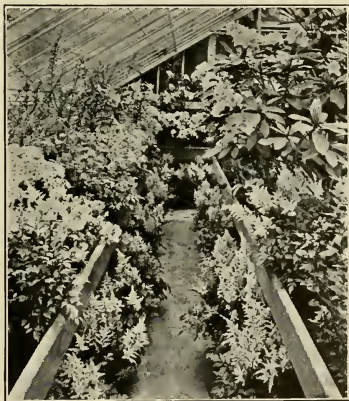
### *How Much Water to Use*

The more gradually the water can be applied the better. When you get experience you can tell the condition of the soil in a pot from the "ring" of the pot when rapped sharply on the side. The less moisture it holds the clearer the ring. For practice in watering knock a plant or two out of their pots ten or fifteen minutes after watering, to see if you have given enough to soak the soil thoroughly through to the

bottom. Do the same thing to find out when they need watering again.

Make a practice of watering rather early in the morning and on bright days. This gives the soil a chance to dry off before night, which is a desirable thing. Where solid beds are in use, great care must be taken not to over-water, especially during the winter months. A whole crop may be spoiled by getting the ground wet and soggy when short days and dull weather have to be contended with.

Fresh air is as much needed as moist air. How can you expect a living thing to be happy when it does not have plenty of fresh air to breathe? Remember, the



Remember that plants, as well as humans, just breathe—and that they can't go out for a walk to take the air!

plant cannot go out for a walk. It's up to you. Don't leave your plants for days with-

out fresh air, and then wonder why they don't do better.

### *When to Give Fresh Air*

In the modern standard construction greenhouse the control of air is a very simple matter. A twist or two of an easy-turning wheel, and the trick is done—the ventilators being placed where they will not cause direct drafts of air to strike the plants.

“Giving the plants air” used to be quite a job when you had to climb up and regulate each sash with a strip of iron full of holes to fit over a pin. But modern ventilating apparatus works so easily, and quietly, and perfectly, that you like to work it. The way you can close your house up in a jiffy when a sudden storm comes out of the northwest; and then having turned on the heat, watch the snow begin to pile up and drift outside, but melt and run off the roof of the glass garden—will surely send a thrill of pleasure to the heart of any lover of plants.

There is yet one other thing which is necessary to keep the plants happy. Like everything else, from a puff-ball to a bishop's soul, a plant must express happiness in *growth*. To keep on growing, it will, from time to time, need more room. More room for its spreading branches; more

room for its increasing roots. And so, if you leave it too long where it is, it gets "pot-bound"—and narrow-minded and cross, in general.

*When to Change to Larger Pots*

Never let the plants crowd. Better a half-dozen good plants than four dozen poor, consumptive looking, measly specimens, such as are not infrequently seen.

How can you tell when it is time to re-pot? By actual examination of the "ball," the mass of roots and soil. To do this the plant is removed from the pot by holding it inverted in the right hand, with the first and middle fingers on either side of the stem, and smartly rapping the rim of the pot against the edge of the bench. (See illustration, page 80.) If the soil is medium moist the plant should come out readily. If it has been growing in one pot so long that a network of tough, yellowish, dead-looking roots have formed around the inside of the pot, it is time for a shift. If the roots are still white and active looking, and the plant is making a good growth, a shift is not yet needed.

In re-potting proceed as follows: First of all, prepare the soil in advance.

Use a pot only one or two sizes larger than that from which the plant is being transferred

—say from a 3-inch to a 4-inch, or a 4-inch to a 5-inch. Shifting into too large a pot leads to many cultural difficulties. Just why and how this is need not be discussed here.



To examine the roots, hold the plant between the index and middle fingers, and rap the pot sharply against edge of a bench or box.

Fill about a third of the pot with soil. Now place the plant in position in the pot and fill in the new soil around, pressing firmly down with the fingers, or by settling it as described in the remarks on potting cuttings on page 54.

In the case of old plants, especially shrubs, it is sometimes necessary to force the new earth between the ball and the old pot with a flat stick, to get it really firm, instead of "potting-on." Plants should go into the new

pot a little deeper than they have been growing before; and the soil in the new pot should be, when settled, merely above the line of the rim or



collar on the outside of the pot, not filled up to the top. This will give some space for holding surplus water, later to soak away, when the plant is being watered.

Plants being put into fairly large pots, 4-inch or more, will need crocking. "Crocking" is one of the words bequeathed to us by the gardeners of old England. It means the placing of some rough material in the bottom of the pot, over the hole, to make good drainage certain. I suppose the term comes from the fact that pieces of broken pots or crocks are used for this purpose. Methods of arranging the crocking are shown in the illustration on page 114.

A little sphagnum moss or leaf mould placed over the drainage material, before the soil is put in, prevents any of the soil from washing through the hole. This is an especially desirable feature where plants are to be brought into the house, or used as gifts.

### *Growing Periods and Resting Periods*

There is one more very important thing to learn about your plants, if you do not happen to be aware of it already: Plants, like folks, require vacations. Their rest periods are well provided for in nature's scheme of things, and they will go on strike if you attempt to keep them working

from one end of the year to the other. That is one reason why some folks fail when they "bring the garden indoors" in the fall. They expect the plants that have been blooming all summer to go right on performing through the winter.

Here is where you merely need to use common sense, or your sense of observation, which is not so common. When plants are grown in the greenhouse the year around, the natural seasons can be followed, letting them take a rest period after the blooming or fruiting period. This may be a few weeks only, but often is two or three months. At this time, as practically no growth will be made, very little water is required. In the spring, when new growth starts, is the time to re-pot, to give them new plant food, and give them more water.

Plants that normally flower in the summer or fall, but which, having been brought in, are good enough to flower in your glass garden in the winter months, should be rested during the summer.

After a very little experience it is easy to tell when the plants seem to be getting tired—new growth ceases, flowers get smaller and fewer, and with some things the leaves turn, and even drop off. When these conditions develop don't attempt to force or even to keep them growing on.

As a matter of fact, you will find your plants very reasonable in the matter of this rest period. Plants which grow out of doors, and naturally have four or five months' loafing time, will do well in the greenhouse if they are given that many weeks.

*Freezing Before Forcing*

With most hardy things, such as Asparagus, Rhubarb, Strawberries, and perennial flowers in variety, freezing before they are brought into heat to be forced will help matters. A handy way to accomplish this is to take up the plants, with plenty of roots and soil, and store them in a deep frame or pit where they can be allowed to freeze, but can readily be reached when wanted for forcing.

Above all things, observe your plants not only lovingly, but keenly. Be on the watch for every change, no matter how slight. And when any change is noted, no matter how slight, don't be satisfied until you have discovered the reason for it. Upon the quickness with which you learn to determine when anything does begin to make your plants uncomfortable or unhappy will depend to a great extent the measure of success you are able to achieve in the glass garden.

## DIFFERENT TEMPERATURE ADAPTATIONS

COOL: 35 DEGREES TO 40 DEGREES—AT NIGHT

*Flowers—*

Agave, Calceolaria, Campanula, Chrysanthemum, Cheiranthus, Cineraria, Erica, Eupatorium, Genista, Iberis, Mignonette, Myosotis, Stock, Sweet-pea, Violet.

*Shrubs—*

Cestrum, Chorizema, Kalmia, Lagerstroemia, Magnolia, Nerium, Punica, Rhododendron.

*Ornamental Plants—*

Aucuba, Bay-tree.

*Vegetables—*

Endive, Lettuce, Parsley, Radish, Spinach.

INTERMEDIATE: 45 DEGREES TO 55 DEGREES—AT NIGHT

*Flowers—*

Agapanthus, Allium, Alyssum, Antirrhinum, Alternanthera, Cactus, Carnation, Canna, Epiphyllum, Erythrinum, Freesia, Geranium, Gladiolus, Hyacinth, Iris, Kalanchoe, Ornithogalum, Oxalis, Pelargonium, Plumbago, Primula, Stevia.

*Shrubs—*

Acacia, Hydrangea, Lilac, and some Roses.

*Climbers—*

Lapageria, Passiflora, Wisteria.

*Orchids—*

Anguloa, Cypripedium, Odontoglossum.

*Vegetables—*

Asparagus, Beans, Beets, Carrots, Cauliflower, Lettuce,

Mushrooms, Onions, Peas, Rhubarb, Seakale, Spinach, Peas, Potatoes.

WARM: 55 DEGREES TO 65 DEGREES—AT NIGHT

*Flowers—*

Abutilon, Amaryllis, Astilbe, Begonia, Bouvardia, Cactus, Calla Lily, Celosia, Clivia, Cyclamen, Fuchsia, Heliotrope, Hymenocallis (Ismene), Lilium, Tropaeolum, Nymphaea.

*Shrubs—*

Aralia, Azalea, Camellia, Hibiscus, Rose, Spiraea, Swainsona.

*Ornamental Plants—*

Ananas, Araucaria, Asparagus, Aspidistra, Aspidium (Dryopteris), Coleus, Croton, Cyperus, Dracaena.

*Climbers—*

Bougainvillea, Cissus, Clerodendron, Jasminum, Smilax, Stephanotis.

*Orchids—*

Cattelya, Coelogyne, Dendrobium, Laelia, Lycaste, Oncidium, Vanda.

*Vegetables—*

Beans, Peppers, Tomatoes, Corn, Cucumbers, Melons.

*Fruits—*

Grape, Peach, Nectarine, Strawberry.

HOT (OR STOVE): 65 DEGREES TO 80 DEGREES—AT NIGHT

*Flowers—*

Achimenes, Aristolochia, Begonia, Cephalotus, Eucharis, Euphorbia, Gloxinia, Lily-of-the-valley, Poinsettia, Nepenthes.

*Shrubs—*

Gardenia, Ixora, Lantana, Philodendron.

*Ornamental Plants—*

Adiantum, Alsophila, Anthurium, Areca, Asplenium, Banana, Bertolonia, Borassus, Caladium, Calathea, Caryota, Cocos, Corypha, Croton, Cyathea, Cycas, Davallia, Dicksonia, Dieffenbachia, Dracaena, Ficus, Kentia, Livistona, Maranta, Pandanus, Phoenix, Platycerium, Rhapsis.

*Climbers—*

Allamanda, Clitoria, Gloriosa, Hoya, Thumbergia.

*Orchids—*

Calanthe, Epidendrum, Phalaenopsis.

*Vegetables—*

Cucumber, Eggplant, Melons.

*Fruits—*

The Citrus family.

## CHAPTER IX

### OVERCOMING THE BUG BUG-A-BOO

IN THE beginning I was awfully afraid of bugs! Not that I was squeamish, because as a boy I collected all the “worms and things”



I could find in field or woods, and kept my nurse and grandmother on the verge of nervous prostration by placing them—the bugs, that is—all over the house in glass tumblers, and shoe boxes with holes punched in the covers.

When I first began gardening under glass every new bug or worm got on my nerves because I didn't know what to do with it—or rather to or for it—or what it was going to do with my cherished flowers and promising vegetables. I tried about every bug medicine there was on the market—with results good, bad, and indifferent according to the real worth of the preparation and my knowledge of how to use it.

It was several years before I had a grip on the situation which gave me the assurance that I could cope with the old bugs, and made me fairly confident that I could fight to a finish any new ones as they came along. So I am not merely playing the part of the cheerful optimist when I say that you will have no reason to lie awake nights worrying about bugs in your glass garden.

First of all, modern greenhouse building has done much to put this bug-business-worry game on the toboggan. Conditions that are bad for plants are good for bugs. The old-fashioned wood house, with its shady corners and rotting benches and crevices that could never be reached, was a happy home for the bug hosts. But the modern clean, light, sanitary, well-ventilated house is anything but good for them. Furthermore, the fact that the modern greenhouse is tight makes it possible to control these intruders in a way which was never possible with houses that became more or less leaky after a few years.

### *The "Remedy" Must Fit the Bug*

It does no good to get excited and begin spraying all over the place with the first thing you can get your hands on when the presence of some insect is discovered. Instead, just take it calmly and try the following plan:



Have you a magnifying glass or a microscope? If not, get one. You will have constant use for it in your indoor garden. It will open up an entirely new world to you. When you become skilled in growing plants, you will want to begin hybridizing them, creating your own varieties. And when you get to that point, you will discover what an interesting part some insects play in the lives of the plants you love.

But, to get back to the business of handling bugs. If you will examine the different kinds you encounter, you will discover many interesting things about their make-up and their habits as the result of closer acquaintance. You will readily come to see that there are two distinct classes among them. Some actually *eat* or *chew* the leaves or other parts of the plant; while others *suck the plant juices* from underneath the surface of the foliage.

### *Chewing Insects Can Be Poisoned*

The injury done by the insects that eat is at once apparent, and they are easily located. But the injury done by the other class, that sucks the plant juices from underneath the surface, is not apparent until the whole plant is seriously affected.

Common sense must tell you that different

methods must be used to control these two different classes of pests. Evidently, the kind which eats can be poisoned by putting poison on their food. It is equally evident that poison applied to the surface will have no effect upon the kind that sucks the juices from beneath the surface. These are the first two things to learn in the war on insect pests,

Now, in any general seed catalogue you will find a half-a-dozen or more things for poisoning chewing insects, but a good arsenate of lead, or calcium arsenate, is the one thing needed. A half pound of either of these will take care of your indoor garden for many months.

### *Sucking Insects Cause the Most Trouble*

It is the sucking insect which causes by far the greater amount of trouble with plants under glass. As these cannot be poisoned, it is necessary to take care of them with some insecticide that will kill by *contact*. The most convenient and effective thing I have ever found is a strong nicotine extract—40 per cent. nicotine sulphate. Of course, a “contact” spray must come into direct contact with the insect in order to be effective. This cannot be applied in advance and left, but must be sprayed directly *upon* the pest.

On a bench full of plants, or where vegetables

are reaching maturity and beginning to crowd together, it is often very difficult to reach such sucking insects as the green plant louse or aphid. Therefore, many gardeners depend on *fumigation* to keep their houses clean. It is an instance of where a stitch in time saves ninety-nine. You can procure prepared strips of paper soaked in nicotine that can be conveniently burned; or get a fumigator. It is an easy matter to make a practice of thoroughly fumigating the house every two weeks or so, and thus keeping it bug free.

### *What to Ward Against*

The most bothersome of all insects are these:

APHIS or plant lice, usually green in color, but occasionally brown or black, as in the variety

affecting Chrysanthemums. They at first conceal themselves very cleverly in the leaf axis,



The greatest enemy of Lettuce under glass is the green aphid. Fumigating or spraying with tobacco preparations will control it.

opening leaves or flowers, or other inconspicuous places. They multiply with marvelous rapidity, and it is extremely important to use control methods *immediately*.

SCALE.—Many plants under glass, and particularly the hard-wooded plants, Palms and



These little scales, not much bigger than a pin-head, fastened to one place, do not look dangerous. But they quickly sap the life of the plant.

Ferns and fruits, are subject to the attack of scale. While these are sucking insects, they do not move about, but just stay in one place and

are inconspicuous—often not noticed at all until the plant begins to die. Take one off with the point of a toothpick and put it under your magnifying glass; you will see that it is a real animal covered with a little shell, or shield. The best way to get rid of these fellows, when they are



When you keep an eye open for bugs, look *under* as well as on top. The scores of white fly on these Fuchsia leaves would never be suspected from above.

just beginning, is to wipe off the stems with a swab of cotton soaked in alcohol. Or, in a more extensive way, use a spray made for the purpose.

**WHITE FLY.**—The white fly, one of the most difficult pests to control, is not likely to bother in houses that are kept clean and well ventilated and fumigated regularly. The “flies” are very small and cannot well be sprayed. The real damage is done by the nymphs, or young of the fly, which suck the juices from the under side of

the leaves. They operate indeed like a scale and should be fought by fumigation. A recent insecticide, "Insectonos," which was awarded an honorable medal by The Society of American Florists, is recommended particularly for the white fly. I have not yet tried it myself, but hear favorable reports on it.

RED SPIDER.—This persistent little pest is about the size of a grain of red pepper, and just about as irritating. Working on the under sides of the leaves, and behind a tiny web, he is not discerned until the leaf shows a tiny yellow spot. The leaf then turns yellow altogether, and eventually drops. The most effective thing to use with these is clean, cold water, applied with as much force as possible. Use a syringe frequently if the water in the house is not under sufficient pressure to give a forceful stream. Indeed moisture in the air is this pest's great enemy, and its presence is indicative of too much dry heat.

After all, the most effective way of fighting off these attacks is to be strict about greenhouse sanitation. Always clean up, and *burn promptly*, refuse, fallen leaves, dead plants, and rubbish of all kinds which might possibly make a harboring place for germs, spores, or eggs. An occasional spraying under the benches with a disinfect-

tant will take little time and help the good work along.

### *Avoiding Plant Ills*

Plant illis, like insects, are much less a menace than formerly. Sunlight, clean surfaces, and concrete are discouraging to obnoxious germs and spores. Occasionally, however, some of the following diseases may appear:

**MILDEW.**—This is usually induced by a sudden change or drop in temperature. The common method of control is to dust the plants with flour of sulphur, or to evaporate sulphur on the heating pipes. (Make a thin paste of sulphur and water and paint it on the hot pipes; or use a regular fumigator.) Roses and a few other plants are particularly subject to attacks of mildew, which causes the leaves to be covered with a powdery white substance, and in some cases to curl up, or even drop off.

**BLIGHT.**—In growing a miscellaneous assortment of plants, especially if some are brought in from outside, there may be an occasional attack of some form of blight. Some of these cannot be cured but they usually can be controlled, so that they will not spread to other plants. In such cases bordeaux mixture is the standard thing to use. Dead plants and leaves should be promptly gathered up and burned.

DAMPING-OFF is a disease which sometimes attacks seedlings and cuttings in the cutting bed. Covering the top of the soil with sand which has been sterilized by heating, and care in watering



The first rule in bug prevention is, *avoid over-crowding*. Better a moderate number of healthy plants than a pack of sickly ones.

Everything said in this chapter in regard to sanitation, good care, ventilation, and so forth, applies perhaps even more to the prevention of diseases than to the control of insects. Strong growing plants are not only less likely to be attacked, but are much better able to withstand successfully the attack if it does come.

(by watering early in the morning in bright weather so that the leaves can dry off during the day) will help as a safeguard. Flour of sulphur sprinkled over the soil just as the little seedlings come up, and among the cuttings also, acts as a preventative.

Everything said in this chapter in regard to sanitation, good care, ventilation, and so forth, applies perhaps even more to the



## CHAPTER X

### ARMSFUL OF BLOOMS AND PLANTS IN ABUNDANCE

IN THIS little book no attempt can be made to give a full catalogue of all the kinds of things you may have in the glass garden, together with detailed cultural directions for each. Such a category would fill several volumes! A list of some of the best books pertaining to growing things under glass is given in Chapter XXVIII. But just as you can enjoy your car without having accumulated a library on the interesting subject of motor engineering, and take pleasure in your outdoor garden without being thoroughly familiar with your "Cyclopedia of Horticulture," so can you enjoy the pleasures of your glass garden without attempting to be an authority on every plant you grow. You will, however, find that having some of the books mentioned is not only helpful, but a source of much enjoyment.

In this chapter are a few suggestions as to the things which you can have most readily, and

which are most certain to behave satisfactorily for you.

### *The Flowers You Can Count on*

VIOLETS.—First of all, perhaps, I would put Violets. The very word itself is a vision of loveliness and fragrance. They may be grown in the coolest compartment or the coolest part of the house. It is best to get good strong plants at the start. Plants ready for growing may be purchased from the catalogue florist houses. Or root them from cuttings of young shoots, grow outside during summer and plant indoors in early fall. These should be put in the bench or bed about eight inches apart each way, or they may be grown singly in pots. They may be grown in a bench near the glass. They like a rather heavy loam, a soil, if possible, with plenty of rotted cow manure.

Keep all runners pinched off, and stir soil frequently. Remove all discolored leaves as soon as noticed. Water in the morning, and keep foliage as dry as possible. Give abundance of fresh air.

CARNATIONS.—Carnations in abundance for personal use may be had from a few plants. Even if your greenhouse is so limited in space and so full of other things that you do not want to



Only one end of a very small house—but think of the dozens of perfect Carnations you can gather for your tables and rooms, and your friends!

give a part of a bench for these fragrant blooms, a dozen or two plants grown in seven- or eight-inch pots will supply a remarkable number of flowers for cutting besides filling the whole house with their spicy perfume.

If you want to start them in the spring, root some cuttings from old plants or small plants, and grow them out in the garden during the summer, bringing them into the house in July or August, for early fall bloom.

A moderate temperature—50 degrees—will answer for Carnations. Set the plants from 8

to 10 inches apart. The plants should be cut back, during outside growth, to make them strong and bushy. As they begin to make growth inside the plants must be supported, for which purpose special wires are made.

**SNAPDRAGONS.**—These splendid flowers are one of the easiest of all to grow. You can get the named varieties used for commercial culture, or have the fun of starting a few hundred plants from seeds, and select the ones you like best for growing under glass. As they are readily propagated by cuttings, you can select shades to suit your fancy and quickly work up as large a supply as you want, to yield flowers for your own use and for giving away.

Plants may be started readily from seed in the spring, early autumn, or in the greenhouse in the fall. You also can buy plants ready to bloom, to put into the house in the fall. Set them about twelve inches apart each way.

**ROSES.**—While the growing of the special varieties of Roses, particularly American Beauties, is highly specialized work, nevertheless there are some kinds which can be grown successfully in the moderate temperature of an ordinary general-purpose house. You can bring in some of your garden Roses by taking them up and storing them for a while as described in Chapter VIII. Or you

can get good young growing plants, and either keep them in pots or set them in rich deep soil about 12 x 12 inches, or 12 x 16 inches each way.

Ordinarily, they are set out in spring or early summer, so as to become well established under the glass before the blooming season begins in autumn. But they may be put in in the fall. A heavy soil, with plenty of well-rotted cow manure, is best.

Bridesmaid, a large pink flower, and Papa Gontier, a good red, Perle des Jardins, yellow, and many others may be grown in as low a temperature as 55 degrees. The little Baby Rambler Roses in pots are most delightfully charming, and flower freely month after month. By all means, have some of these even if you do not attempt the larger sort for cut flowers.

Perhaps the most charming way of all of using Roses in the greenhouse is to have some of the climbing or semi-climbing sort. Many of the climbers, such as the Marechal Niel, the most glorious of all everblooming yellow Roses, and others of the Noisette type, too tender to be planted outside in the northern states, will thrive under glass.

Even with a single medium-temperature house Roses can be had the year round—and I'd rather have the clustering golden masses of the Noisette

against the wall of the work-shed and greenhouse than all the long-stemmed, twelve-dollar-a-dozen, purple-in-the-face - with-their-own-importance American Beauties ever shown on Fifth Avenue. Perhaps, however, you are a real admirer of American Beauty Roses, and futuristic cretonnes and all such—so let's change the subject!

CHRYSANTHEMUMS.—These generous sized and glowing coloured flowers are the most easily grown of all the flowers you will want especially for cutting in your glass garden. That is, unless you will be contented with nothing less than giant blooms such as the commercial growers have ready for the football season and the fall shows.

Personally, I think there is no comparison in real beauty between a symmetrical plant covered with flowers of medium size, and the stiff, artificial looking one-to-a-stem exhibition blooms usually seen. You may have the big fellows if you want to, but it means more work. And, of course, you can have both. The culture, up to a certain point, is the same.

### *Starting the Plants*

If you want to grow your own "mums" from the start, begin by securing a few of the old plants or roots after the fall blooms have been

cut off. You can get these from any florist, or greenhouse-possessing friend, as they are usually "thrown out" after the crop is out.

These roots, planted in deep flats, or directly in the soil, may be placed under a bench or anywhere out of the way. Give just enough water to carry them along until January or February. When the new shoots, which will soon start, are a few inches long, they are rooted in sand. They are grown on, giving two or three shifts until May. They may then be set outside in the soil to be taken in later to the bed or bench under glass. Or, if they are to be grown in pots, or plant boxes, they are kept in these. Or small plants may be bought in May or June, for growing on for fall blooms.

While "mums" like a rich, strong soil and are greedy eaters, they are cool temperature plants, requiring little heat, even in the fall. In fact, they may be grown without any heat, in a cool house, or a grape-house. But the moderate-temperature house will answer.

### *Training and Disbudding*

For the biggest blooms, the plants are trained to single stems, all side shoots being pinched off as they appear. Only the terminal bud is left, all others being pinched out. For symmetrical,

spreading plants, with a dozen to three dozen flowers of fair size, the plants are pinched back as they grow, to get the desired shape and number of branches. And all the buds but the terminal bud on each branch should be removed. In professional parlance this is called "disbudding."

For exhibition purposes, the plants are spread and trained by tying the branches to a wire frame, so as to get a perfectly formed, circular mound of blooming surface. Care must be taken to select the buds to be left, so they will open at about the same time. There is a good deal of fun in trying your hand at this training.

To get fine blooms, the plants should be fed with bone meal, tankage, liquid manure, or some special "mum" fertilizer, until the buds begin to show color.

The insect pest most likely to give trouble is the aphid—in this case a black variety. It can be controlled absolutely by the use of 40 per cent. nicotine sulphate; or, under glass, by fumigating with a nicotine preparation.

### *Plants for Winter Flowering*

With all the pleasure that cutting your own flowers will hold for you, I don't think you will



long be a glass gardener before discovering a greater joy than even your finest cut flowers can give, and that is the growing of plants to take into the house, alive and laughing, to bring sunshine into your winter-beleaguered rooms. Cut flowers, within the limitations of "the trade," any one may obtain in abundance; but to have your own plants gathering up the golden sunshine, to save and store it, and then scatter it again through your living rooms, bedrooms, and all over the house, *that* is something you may attain to only with a glass garden of your own.

The plants that may be grown for your pleasure in this way are so numerous that I cannot attempt here even to catalogue them. Some of these I mentioned in an early chapter when telling the things I did with my own first little house. Let me urge you, however, not to be afraid to try the good old homey things.

GERANIUMS.—Have you any idea of the wonderful shades and colors there are in the dozens of varieties available—or do you know them merely as "red," "pink," and "white." Get half a dozen Marquise de Castellaine, with its enormous brick-red trusses on stems eighteen inches long, and stiff as a goldenrod. Then there are delicate pinks and lavenders. And do

you know the new Pelagorniums, or "Pansy Geraniums," such as Easter Greeting and Swabian Maid? A new race, blooming earlier and very much longer than the old Lady Washington that Grandmother used to grow.

**HELIOTROPE.**—Then there is the Heliotrope. "So very plebeian," you say. But have you ever enjoyed the fragrance of one blooming in mid-winter, in your dining-room window? You will even rejoice that it is old fashioned and welcome it right into the family circle, just as you would a certain silver-haired, little old lady who perchance is now but a hovering memory of your childhood days. Incidentally, if you want to grow your own Heliotrope from seeds, you will get a wide range of shades and colors from which to make a selection.

Some professional gardener may tell you that the seedling plants aren't as fragrant as those grown from cuttings. This may be so, although I have always suspected that this, like many of the theories of the practical grower, was slightly tinged by a vivid imagination. Anyway, I have grown thousands both ways, and their fragrance always seems to me so near a perfect perfume that I have never discovered the difference.

**FERNS AND PALMS.**—Some of the Ferns and Palms are tender and require special tempera-



A small part of a bench or two, devoted to Ferns and foliage plants, will keep your living room and verandas constantly supplied with fresh, green, living decorations.

ture and shading if you want to grow a complete selection. However, many of the finest kinds will get along perfectly well in a general-purpose house, and can be kept in condition there for bringing into the dwelling house or the conservatory, as wanted.

Used among flowering plants, of course, the Ferns and Palms add a touch, an artistic finish, in the decoration of your rooms that nothing else in the world can give. Then, too, the pleasure there is in having your own Palms and Ferns clean, green, and bright looking.

*Have a Living-room Plant Room*

Of course, the ideal way to use these plants is to have a conservatory. Not the old-fashioned kind with a shaded roof and a few rare plants,



Have a living-room plant room! A sunny spot where you can enjoy your plants and your reading or sewing at the same time.

which have to be looked after about as carefully as goldfish, and kept mostly to show visitors on rare occasions; but a general living-room plant room flooded with sunlight; happy with flowers in bloom; and made delightful with the ever-green things which have been made to look and to feel at home there. A real plant room is really

a part of the house, where you will find a cozy table, magazines, and comfortable chairs; a pipe bowl mayhap—a place to live in with living plants. Some plants may be kept in a conservatory of this kind alone; but if a glass garden is at hand to keep up the supply of plants through the

varying seasons, and to put things back into, when they have become a little bit house worn, then you can have a constant supply of plants in perfect condition.

CACTUS.—Other plants which should not be overlooked for the collection in your glass garden are the Cactus, citizens of the desert. While not the most charming, they are in some respects the most interesting of all plants, and they are the easiest of all to care for. Many sorts simply cannot be killed; they will exist no matter what you do to them; even a broken-off piece set in dry sand will take root, grow, and bloom. Furthermore, they occupy very little space and will not need to be re-potted or given much other attention. You will have lots of fun with them, and a collection that will last for years will cost but a few dollars.

VINES.—With the greenhouse vines you can produce the most charming effects of all. They make it possible for you to do real “landscaping” within the limits of the glass garden. They may be planted in the solid soil under the benches and sent up the ends of the greenhouse, or along the rafters, so that at any point you may frame, in an inimitable way, any picture you wish to create.

In addition to the Climbing Roses already

mentioned, there is the Swainsona with Sweet-pea like clusters of white and pink flowers and attractive ferny foliage. Then there is *Asparagus plumosus*, the climbing "lace fern," not only



The beauty of vines you can have in your glass garden as well as outdoors. Why not train them to permanent positions, as has been done here?

delicately beautiful where it grows, but supplying the most beautiful of all "greenery" to use with cut blooms.

SWEET-PEAS will do wonderfully under glass if not given too warm a temperature. You may have Sweet-peas not only blooming in your glass garden, but for days you can have their sweet fragrance right in your breakfast room.

How? Merely by sowing the seed in, or transplanting the plants into, a long, narrow wooden box four or five inches wide and six inches deep, which may readily be moved. Such boxes are often used to start the plants in till they can be moved to a place where there can be given more head room when they are about ready to begin

blooming. A box of this kind can easily be moved right indoors to flower there. The box itself may be attractively painted, or a metal case may be provided that the wooden box can be slipped into. Of course you sow only the winter-flowering strain for indoor use.

There is also a low-growing variety of Sweet-peas well named Cupid, which may be simply planted in pots or hanging baskets, and allowed to flower there. They are not only unusual and effective in the greenhouse, but make unique plants for gifts.

THE BUTTERFLY PLANT, *Thunbergia*, is very easily grown, and covers a wide range of colors—blue, purple, yellow, and combinations of these.

SMILAX is familiar as “greens” for florists’ use, but until you have seen this growing after your own training, the most airily graceful and beautiful of all decorative vines when covered with its tiny white flowerets, you can have no idea of its real beauty. And there are the Ivys.

The TENDER or ENGLISH IVY (*Hedera Helix*) is ideal for under-glass culture. With a little training you can produce with it almost any effect that you please, and it will “stay put” for years. There is a variegated form which may be used effectively—but as with any plant of this kind, it

is an easy thing to go too far—to lose all emphasis by the use of too much of it!

The most rapid-growing of all is what used to be known as GERMAN IVY. It is very valuable for quick growth and temporary use.

Never miss the opportunity of visiting other people's glass gardens whenever you can. In some commercial establishments you will run across things that are new to you; you will also see new things which are listed in the catalogues. Buy a plant or two "on suspicion" to try them out. A couple of two- or three-inch plants are never expensive, and if you like them, you can usually get as many as you want from these. Keep your glass garden, as well as the plants in it, growing!



## CHAPTER XI

### BULBS—TO KEEP YOU SMILING

**BULBS!** What is more fascinating? There are the little brown shiny ones that look like overgrown Spanish Chestnuts, and feel so satiny smooth to your touch. Then there are the ungainly turnip-like ones that look as if they must have been grown to chop up for feed for the cows in winter. And in another basket, crinkled little ones that look as dead as door nails.

And yet in these dull baskets, what gorgeous colors lay dormant!

What wonderful daubs of burning crimson, gleaming yellow, and azure blue your impres-



Bulbs to lend color to your rooms in winter! You can bring them to bloom in the glass garden, and then enjoy them, anywhere in the house, for days.

sionist artist could get for his canvas here could he but squeeze the colors from these wonderful tubes. For when it comes to colors, the bulbs are in a class by themselves. The first big thing about bulbs is that you can have a succession of bloom from early fall until spring and do practically all the work in connection with them in a single afternoon.

Here's how you do it! First of all, procure



Cross-section of a pot, showing the method of "crocking" and filling it. Drainage material placed over hole in the bottom, prepared soil and space inside rim at top to hold water.

good bulbs. Go preferably to some house that makes a specialty of them. The simplest sorts to grow are Tulips, Narcissus, and Crocus. Duc Van Thol Tulips are the earliest to bloom. Other good sorts may be had in wide variety to suit your tastes.

The bulbs may be grown either in bulb pans, which are convenient to bring into the house when in blooms, or in flats. The latter are all

right if you are growing quite a number and want them for cutting.

Begin operations early in October. Use a very light rich soil, and put drainage material in the bottom of the pans

or flats. Cover this with an inch or so of soil and put the bulbs in place. Set them, top side up, near enough to nearly touch one an-



For flowers or cutting, put the bulbs in shallow flats; then store in a cold, dark place to make root growth before forcing.

other. Then cover over with soil, packing down firmly, until the bulbs are an inch or so below the surface.

### *Make Them Make Roots before They Make Tops*

Now the secret in bulb growing is to get them to *grow roots* before the tops start. If, after planting, you leave them in the light and heat, they will immediately start leaves, and amount to nothing. To prevent this, they have to be stored where they will first *make roots*. A deep frame may be used for this purpose, or a dark, dry, cold cellar; in either case you must be sure that the storage quarters are free from mice. Or a trench may be dug, in a well-drained spot,

about a foot deep and long enough to hold your bulb pans and boxes.

Make tags for each variety, making very long markers that will stick up above the soil. If a trench is used, cover with six or eight inches of soil. In the frame or cellar, keep absolutely dark and water only enough to prevent drying out. On the approach of freezing weather, protect the frames with mats or cover the trench with manure or leaves to protect from freezing.

This treatment results in a strong growth of roots without starting the tops. Then, after four to six weeks, you can bring into heat the Hyacinths and the Polyanthus Narcissus, and a little later the Early Tulips. Other Tulips should have at least eight weeks' start before being brought in.

Keep them rather cool when first brought in—45 to 50 degrees is warm enough for the first week or so. Water thoroughly, and keep them well supplied even after the growth starts.

HYACINTHS sometimes begin to flower before they have made much stem. This may be corrected by placing an inverted pot over the plant to "draw it up." Keep as near the glass as possible, and give plenty of fresh air. By bringing in only a few at a time, a continuous succession of bloom may be had until early spring.

FREESIAs may be grown in the same way, or started without the preliminary root growth if placed where it is rather shady and cool, so that they will start slowly.

OXALIS, of which there are several very beautiful varieties, is ideal for a plant for hanging baskets, or to trail over the edge of the bench. Be sure to try the different kinds. They multiply freely and you will soon have all you can use and some to give away. Oxalis should be started before freezing weather to be in good bloom by Christmas.

CALLA LILIES are not "forced" like the Tulips and similar bulbs, but require a rather high temperature and an abundance of rich, heavy soil.

They can hardly have too much cow manure and water. They can be grown easily under a bench where they will be near the heating pipes and get the sunlight on the north side of the wall. A better plan is to give them part of a bench directly over a heating pipe, where their roots will be kept extra warm. They may then be grown in the same house with Carnations and other medium-temperature plants.

There are a number of varieties besides the large white ones which the florist uses. Try some of the other sorts, such as Little Gem, Godfrey, and Elliotiana.

GLADIOLUS are very easily forced. It is not necessary to give them any preliminary storing; merely plant the bulbs in pots or solid benches where they will have a rather cool temperature. They are easily grown between Carnations, or in the vegetable house. There are several varieties especially adapted for forcing which may be kept for that purpose, but you can grow almost any of your favorite garden sorts if you are willing to wait a little longer for the bloom.

Young bulbs, which are thick through in proportion to size, are better for forcing than much larger, old, flat bulbs.

SPANISH IRIS is another most delightful little flower which may be very easily forced and grown in the glass garden. While these are Iris, they are bulbous plants. The foliage is rather grass-like, and the gracefully shaped, beautifully colored little bloom has somewhat the appearance of a cross between an Iris and an Orchid.

TUBEROUS BEGONIA is another thing not to be overlooked. This beautiful flower is not nearly as well known as it should be, for the reason that the florist can make little use of it. There are wonderful colors, and the plant continues to grow and bloom for months. When they are through, the tubers are dried off, put away in sand and sawdust for a rest, and kept moist

enough to prevent shriveling—then after a few months brought out again. They are one of the few flowering plants which do well in part shade.

These things by no means exhaust the list of beautiful flowers which come wrapped up in bulb packages. The gorgeous blooms of the *Amaryllis*; the wonderfully colored and mottled leaves of the *Fancy Caladium*; the *Regal* and *Easter Lilies*; the charming *Cyclamen*, which, by the way, is one of the most brilliantly colored and wholly



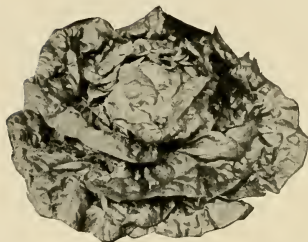
Some of them, like *Cyclamen*, you can grow all the way from seed; or buy nearly ready to bloom.

satisfactory flowers which grow in a medium temperature—with all of these and others you are probably familiar.

None of them offers any particular difficulties. *Lily-of-the-Valley*, as the florists handle it for forcing, requires a good deal of bottom heat, but you can take up clumps from your own outdoor plants, and grow them in a moderate temperature under a bench. By bringing in a clump or two occasionally, you may have an almost constant supply of this fragrant and delicate queen of the fairy flowers.

## CHAPTER XII

### FRESH VEGETABLES THE YEAR 'ROUND



Lettuce all winter—big solid heads that are crisp and crackly, just like those from your spring garden.

winter! A Radish when it is wilted is a shoe-leather substitute. A Tomato that has been picked green and shipped five hundred miles to market and “ripened” in a heated store-room is vastly unlike the crimson globe of juicy goodness that is grown on a vine in the sun in your glass garden until it is ready to come off at a touch. There is only one way to have real vegetables in winter—and that is to *grow* them in your greenhouse.

And when it comes to the little personal gifts



out of the ordinary—the little things which cannot be easily duplicated, which carry their own evidence of personal thought, with a note of cheer and charm—nothing makes quite so crisp and welcome a reminder as a basket of vegetables of your own growing. A head or two of buttery-looking golden-hearted Lettuce, in contrast to the rich red of real ripe Tomatoes, with the pinkish tips of fresh Radishes peeping out from beneath, is a gift for a king to give!

Practically everything that has already been said regarding soil, drainage, watering, fertilizers, and protection from insects, applies to the growing of vegetables as well as to flowers.

### *The Sure Satisfaction Ones*

The things which may be grown readily are Lettuce, Beans, Beets, Tomatoes, Cucumbers, Carrots, Radishes, Spinach, Cauliflower, and Melons. Of these, Tomatoes, Cucumbers, and Melons naturally require the more heat.

Where only a single house is available, they are usually grown by planting them early in the spring, after the other things have been grown through the winter. In this way the increasing temperature of March and April is taken advantage of, to bring on a crop weeks ahead of that in the outside garden.

Asparagus, Rhubarb, and Chicory—the last one of the most delicious of all salads—are easily grown by taking up the roots and forcing the plants. They can be grown out of the way, under a bench, if the space is limited.

While these few things are easily grown you are by no means restricted to this list. Practi-



Corn and Peas can be grown in a greenhouse just as well as Radishes and Lettuce, but their yield does not pay so well for the room they take. That's why so few grow them.

cally anything that grows outside will grow inside if given the space. Corn, for instance, thrives wonderfully; Peas may be had in profusion; Eggplant will reach ideal development; and so on to the end of the list. It is almost wholly a question of space. Most of the vegetables are grown in benches rather than in pots, the bench having advantage of giving more head room, more soil per plant, and requiring less frequent watering.

If the old soil is used, it should be thoroughly enriched by digging in several inches of well-rotted manure, in the fall. It is best, however,

to use fresh soil. The old soil may be piled up outside, left for two seasons, and then used again. Sometimes the old soil is sterilized by steam, or with formaldehyde. The latter is the easier. Merely soak the soil thoroughly with an application of formaldehyde—one pint to 30 gallons of water.

*Start Lettuce in August*

Start the plants for the first crop of Lettuce outdoors, in August. Sow the seed in a sheltered



When Grand Rapids Lettuce gets this size, it's just right for transplanting either to the greenhouse bench or to the garden.

place or in a frame where it can be shaded. Prick off the little seedlings as soon as they are big enough to handle, putting them in thumb pots, in flats, or in a bench, three inches or so apart each way. Before they begin to crowd, they should be transferred to permanent quarters. This should be six or eight weeks after sowing.

The secret of successful growing is to do as little watering as possible. A very thorough watering should be given just before or after setting the plants, and not again until the soil is quite dry.



A plant of Grand Rapids Lettuce ready for setting out in the bed.

Under favorable conditions one or two waterings will carry the crop through until big enough to cut.

Where only a few heads for a small family are wanted, it is very easy to grow them in pots. A pinch

of seed sown every two weeks or so will give enough plants to keep about a couple of dozen heads coming on continuously. During mid-winter, you are likely to get surer results this way than in the growing in the bench, as there is less danger of over-watering and rotting, and they may be more readily protected from the garden aphid, which is the most serious pest

in growing Lettuce indoors. For aphids, tobacco dust sprinkled between the plants when they are set out, and regular spraying or fumigating to prevent their getting a start, should be used.

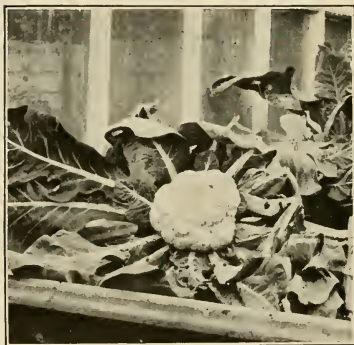
Mignonette, while not known commercially, is one of the most delicious of all Lettuces if you do not mind the slight brown tinge of the leaves. It grows readily under glass. May King and Big Boston are standard varieties. Grand Rapids, which does not form a head, but which is deliciously crisp and tender when grown under glass, is much easier to grow to perfection than any of the heading sorts. If attempting Lettuce indoors for the first time, I would use half of this and half of one of the heading varieties.

Just after planting, and while the heads are maturing, it is of advantage to have the temperature a little cooler than during growth. If it can be regulated, a little below 50 degrees at these times will be ideal. But for personal use they will come along all right in a general-purpose house where the temperature is about 50 to 60 degrees.

### *Some Root Vegetables for Under Glass*

RADISHES grown in your glass garden will be big enough to begin eating in less than three

weeks after sowing the seed. For commercial use, one of the smaller earlier turnip varieties is usually used. But after trying many kinds for my own use and also for local market, I planted only the Crimson Giant Globe. This is later than many of the others, but it has been my experience that the roots get as big as the others at the same age. However, it is all a matter of taste, and your favorite radish will



Cauliflower, "the cabbage with a college education," grows to perfection under glass.

grow indoors as well as out. One advantage of Crimson Giant Globe is that it will remain crisp and tender long after most others. The commercial grower, of course, wants to clean all his crop out in one or two

gatherings; but for table use one wants just the opposite.

Avoid sowing the seed too thick. No matter how thin you sow it, you will have to do con-

siderable thinning. Do it just as soon as the little plants are up.

BEETS and CARROTS are merely sown in rows like Radishes, and thinned out promptly when they start; or you can plant the seeds in flats and set them out in rows later, if you cannot spare the space to sow them where they are to mature.

A good plan is to sow Radishes between the rows of Carrots, and transplant the Beets. You will get better results from the same ground. The Radishes will be gone before the others need the room.

CAULIFLOWER should be started and grown to considerable size in pots before setting out in the bench.

### *Tomatoes for Fall and Spring*

Where TOMATOES are to be grown in a general-purpose house, they are not usually started until about midwinter; or in July or August for a fall crop.

The little plants may be brought on in a warm corner where they will have bottom heat; or a special frame may be constructed over one end of the bench where a temperature of ten or so degrees higher may be maintained. A frame of this sort will be useful for many purposes, such

as starting the seed of tender plants that require more heat. The little plants should be grown on and re-potted until they are of good size. In fact, the first fruits may be set before they are



The Tomato plants may be grown in pots, occupying little space, until, with the first fruits already formed, they are ready to set out.

put in their permanent positions.

For convenience, where only a few plants are being grown, they may be given a final shift to 10-inch pots, or put into boxes ten inches to eighteen inches square and twelve inches deep. The large-size box will hold three or four plants.

These are readily moved, as the plants get big, to positions where the vines can be trained up along the rafters or side walls. Use a variety adapted to greenhouse purpose. Comet, while not a large fruiting sort, is one of the best I ever



grew under glass; perfect in form, smooth, round, dark red fruit. The large-fruited varieties may be grown, but after you try the two side by side, I think you will use one of those suggested above.

Unless the crop is maturing so late in the spring that the bees come in, it will be necessary to hand pollinate the crop. Jarring the vines will do this, but not perfectly. It is much better to get a camel's-hair brush, or rabbit's foot, and go over the vines every day or so, transferring the pollen from flower to flower.

The plants are usually trained to a single stem, which is pinched off when the end of the support is reached. The vines, of course, will have to be kept tied up. Use raffia which does not cut the stems like twine.

### *The Vine Crops Under Glass*

CUCUMBERS, like Tomatoes, need extra heat, especially at the start, but may be grown in the general-purpose house. Start the plants in July or August for early winter crop, and in March or April for early summer crop, in a general-purpose house. In a special house, of course, they can be grown continuously. Put four or five seeds in a four-inch pot, using very light soil such as is recommended for sowing flower seeds. A couple of inches of manure in the bottom will both fur-

nish drainage and help to form a network of roots that will hold together when the plants are set out. If planted in a general-purpose house in a solid bed, they can be set over a trench filled



"Cukes," as they are trained up under the sash bars, occupy very little bench space.

with fresh manure, which will give them bottom heat and will help get a strong start. The vines may be trained in any way you like. Allow about four square feet of bench space per plant. A convenient method is to

train them to wires, supported six inches or so below the sash bars. Pinch the main stem when it reaches the end of its support. Cross wires hold the laterals that are sent out from the main stem. This forms a network, allowing the growing fruit to hang down, and also makes it easier carefully to watch the vine and fumigate when neces-

sary. The green aphid is likely to be the worst pest.

As to varieties, I know of no American sort better than Davis Perfect; but you should try some of the English "forcing" Cucumbers, such as Improved Telegraph. The English sorts do not require pollinating.

MELONS.—  
Melons are handled in much the same way as Cucumbers, except that the growing fruits are so heavy—weighing six pounds or more each—that they have to be supported in hammock-

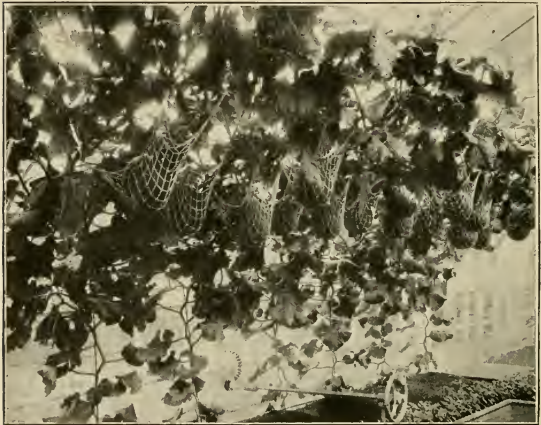


Think of having Melons like these for your own picking. Twenty-four of them (count them) from this little 2 x 4 corner!

like nets to prevent their dragging the vines from their support. These inside Melons will

have a flavor that you cannot imagine until you have tried one of them.

As to variety, the best way is to try several at first until you find the one best suited to your own tastes. Blenheim Orange, British Queen, and Royal Jubilee are excellent sorts in my ex-



You can get even more perfect results. Such Melons as these, for instance, grow only in a glass garden.

perience. Or your favorite garden variety may be grown. Even if you haven't a special fruit house, you will enjoy planting a few Melons in your glass garden. And don't be afraid about

having them grown with Cucumbers. There is nothing to the thought that the one influences the other.

**RHUBARB and ASPARAGUS.**—To have succession, Rhubarb and Asparagus should be taken up in sufficient quantity to bring them in at three or four different times during the winter, as after a period of forcing the roots become exhausted. Plant them in very rich soil, and if you have a small house, plant them under a bench where they will have the sun on the north side of a walk. Use nitrate of soda generously as the growth starts.

**MUSHROOMS.**—The culture of Mushrooms is quite distinct from that of any other vegetable crop.

The first essential is a place where the temperature can be kept between 55 and 60 degrees. Under a bench in the greenhouse answers admirably. It may be kept shaded, but need not be absolutely dark.

The second essential is a place where the atmosphere may be kept evenly moist. Space under the benches, shut off by a curtain or bagging, may be kept in this condition.

The third essential is the manure which forms the basis of the Mushroom bed. Unless this is properly prepared, success cannot be expected.

Secure fresh horse manure. It may be saved from day to day, but is better if a sufficient quantity may be had at one time. Either the straight manure, or manure with short wet straw in it, may be used. Save it in a pile, turning and wetting occasionally until enough has accumulated to make a bed. Stack in a compact heap, under cover if possible. Water until moist if it is dry. Tramp down.

In about three days, heating will begin, as indicated by "steam" beginning to rise from the pile. Then restack, putting the outside inside, and wetting down again if at all dry. *It is most important to keep the fermenting manure evenly moist, without being wet.* After the second turning, leave until the pile again steams and then restack once more. At this time add about one fifth, in bulk, of garden or pasture loam to the manure. After the third or fourth turning, when the heap is evenly heated through, is moist and springy, and not disagreeable in odor, it is ready for the bed. The temperature, as indicated by a thermometer, should be between 100 and 125 degrees.

The bed is made about ten inches deep. It is held in place by a 10-inch board on edge, when made under the bench. The first five inches may be of fresh hot manure covered with five

inches of the prepared manure. *It should be tramped or beaten down firmly as it is put in.* Then cover lightly with salt hay, bog hay, or straw, to hold the moisture. The bed is left for a few days, until the temperature recedes to 85 to 90 degrees. Then put in the spawn. Use pieces of brick about the size of an egg. Place 12 x 9 inches, and 2 to 3 inches deep, pressing the manure down firmly over it. The bed is again left, for eight to ten days. The hay covering may be lightly sprinkled or "dewed over" with warm water two or three times, to maintain the moisture.

#### *Putting on the Loam Blanket*

In eight to ten days, if the spawn is "running" properly, a white threadlike or frothy substance will appear. Then remove the hay, and cover the bed evenly with one to two inches of sifted soil, pressed down firm. Light loam, from garden or pasture, is best for this purpose.

Maintain the moist condition by occasionally wetting down the walks, side walls, etc. If the bed shows signs of drying out, water thoroughly with *warm* water—80 to 90 degrees. A little nitrate of soda—about a spoonful to every ten gallons—added to the water will increase the yield.

The bed should begin to bear in six to eight weeks, and continue for about three months. Remove all stems when gathering. And keep a little sifted soil on hand to fill up holes made by removing big clusters.

Finally, remember that failure with Mushrooms is most often caused by having the manure too dry, or allowing the bed to dry out.



## CHAPTER XIII

### FRUITS FOR YOUR OWN PICKING



Here's one member of the family who will vote for the all-year-round garden!

WHAT is it that is so fascinating about fruits? You may grow the most glorious Roses, or have the solidest heads of Lettuce, but until you have picked your own fruit in your glass garden you will not have learned its ultimate delights.

GRAPES.—Of course, for bunches of Grapes that will be almost too heavy to lift and which will carry off blue ribbons in the fall exhibitions

you will need a special grape house and an experienced grower. But here again, because some people grow Grapes this way, it seems to have spread that without such equipment you can't attempt to grow Grapes at all. Now, I know that is not so. Because I have done it!

In that house which I rented, that I told about earlier, there were some dozen Grapevines of the hothouse varieties, such as Black Hamburg, Muscat of Alexandria, etc. They were planted in a solid bed against the south side of the house so that their roots went down under the foundation, out into the soil on the outside of the house. Thus the roots would remain inactive until quite late in the spring, although we were growing a general collection of things in this greenhouse. The part that was occupied by the Grapes was not given over to them until after we were through with it for other purposes, along in May.

It was my first experience with hothouse Grapes, and I was able to give them only indifferent care, yet they bore abundantly and produced such grapes as, until then, I had never tasted.

Under glass, Grapes are trained to a single stem or cane; after fruiting each year all the laterals are cut back to a single eye. The vines can then be "laid down" out of the way, along

the wall. They are usually planted three to four feet apart. One thing I found out was that to get good-sized berries it is necessary to thin out the individual Grapes on each bunch as they begin to crowd, when they are almost the size of green Currants. This requires steady nerves and a keen eye. Grapes are the rankest kind of feeders, and you will find it almost impossible to give them too much plant food.

Limit the number of bunches. Even with a strong feeding, only two bunches are allowed to set on each lateral, and the vines then pinched off two leaves beyond the second bunch.

Grapes are often grown in what is called a cool grapery; that is, the house is not heated and the vines are allowed to freeze and remain frozen during the winter. The object of having such a house is to start them early and give them plenty of time to develop under perfect conditions in the fall. If you can possibly have one, you will find that a small fruit house in addition to the regular greenhouse, will afford all kinds of fun.

However, you can have some fruits without a special fruit house. They can be grown in pots or wooden tubs, and be brought into the house when it is time to start them in the spring. They are stored in dormant condition during the

early winter months. If you have never seen Grapes growing in this way you can't realize the small amount of space required in proportion to the outdoor crop. Protected, sheltered, and given ideal conditions in every way, the quality of the fruit is remarkable. The gods on Olympus must have had all their Grapes grown under glass—otherwise, their nectar could never have won the reputation it did!



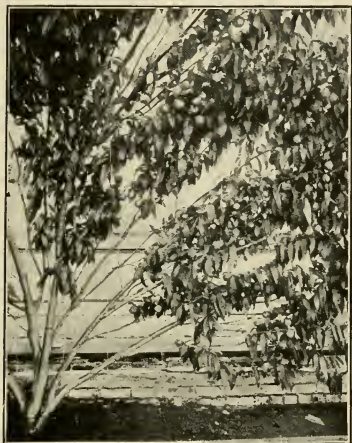
You needn't be a millionaire to enjoy real fruit from your own glass garden. A half-dozen Grapevines, grown like this, will give you pounds of the most delicious Grapes you ever tasted.

#### *Other Fruits to Grow in a Single House*

But Grapes are not the only thing possible without the expense of a special house. Fruit trees, grown in pots or boxes, may be brought into the general-purpose house after being stored in dormant condition for their rest period, and will grow fruit most generously. Just take a look at the little potted Peach trees. Do you think it would be worth while to bring a few into your glass garden, about the middle of win-

ter, so that you could have perfect fruit ripening at the time your neighbors are thinking about spraying their outdoor trees?

PEACHES.—Did you ever taste a Peach grown

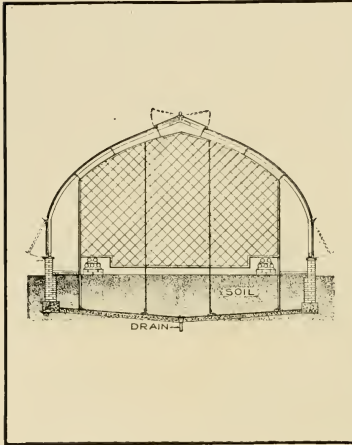


under glass? It is so full of juicy tenderness that it is almost ready to burst open at a touch. If you have ever picked a real ripe Peach from a tree, even outside, you know how incomparably better it is than the commercial fruit which has to be picked "firm" and shipped to market. But

Think of Peaches and Nectarines, sugar sweet and juicy, ripened on the tree till they are ready to come off at a touch!

never until you have tried the glass-grown product will you know the perfection of lusciousness and flavor which a Peach or a Nectarine may attain. And you can have them just a few months after you buy the little trees, ready to fruit.

It does not take a very large house to have an under-glass orchard, even where the trees are planted in the soil and grow there undisturbed year after year. These trees are trained to grow on trellises.



This shows cross-section of a special fruit house. Note that the concrete bottom forms a basin to hold the rich plant soil. The transverse wire screens are used to train the fruit trees on.

They are spread out fan-shaped, so that every fruit is kissed by the sun, on both cheeks, every day. If you have never done it, you cannot imagine what fun there is in training the growing trees—pinching the plant back here and there until you have it where

you want it, making it grow out sideways, or up, or down, until you have a framework after your own design or pattern, on which the tempting fruits will hang.

The best way is to have the fruit house about 18 feet wide; then you can plant the trees down the centre, so that you can have the trellises built across the house. These may be fastened in either direction and you can tend them from the walks along the sides of the house or the walk may be down the centre of the house.

PEARS may be grown to perfection under glass very readily. The trees are naturally broad and short-jointed in habit of growth. The fruit seems to have an especial liking for under-glass conditions.

PLUMS are neither quite so desirable nor so readily managed, but if one has a special fruit house, they may well be included. It is well to grow them, however, in tubs or boxes, as the best results are obtained by allowing the fruit to ripen *outside* when it has about matured in growth.

CHERRIES.—I have never attempted to grow Cherries under glass, but they are grown to some extent. Being less certain than the other things, however, they would seem the last to try. The small trees when they are in bloom are so beautiful that the decorative value of the plants alone is ample reward for their care. Most of the varieties may be grown under glass. They not only give fruit of delicious quality out

of season, but are most charming in appearance when fruiting.

*Ripe Red Strawberries When the Snow Flies*

STRAWBERRIES.—The modest little Strawberry is a perfect picture with its crimsoning fruit



A single pot of Strawberries, after a few weeks' growth inside, will yield like this! Better than paying seventy-five cents a quart for half-ripened fruit!

and the white flowers in late winter, when one is getting impatient about the way the snow hangs on and the freezing nights seem to show no indication of letting up.

Good, strong  
new crowns

from the outside garden may be potted up and, after *resting and freezing*, brought into heat and fruited. But the most satisfactory method is to grow plants especially for forcing. Start early in July and root the runners in three-inch pots, with prepared soil plunged up to the rim. A clothes-pin or a small stone will hold the runner in place until rooted.



As the little plants grow, re-pot into four-inch and then into six-inch pots, using a considerable amount of cow manure and bone flour in the last potting. This will give strong, vigorous crowns by late fall, which may be put in a frame and left there until along in January. Then give them the coolest place in the house, or the coolest house.

After growth starts, give a little warmer temperature—45 to 50 degrees at night, and keep the plants as near the glass as possible. A very good way is to use suspended shelves, with a couple of wires tacked along the sides, to prevent any danger of the pots falling. If a warmer temperature is available, the pots may be moved, when the berries begin to reach full size, as they will color more highly and have a finer flavor if they can be given 55 or 60 degrees during the period they are maturing; but they do not absolutely need it. The main points are to have a good rich soil, perfect drainage, and keep the plants where they will receive all the sunlight possible.

In special houses, of course, they can be forced much earlier, but this requires extra work, and the flavor, until "Old Sol" really begins to get his courage back along in late February or March, is not up to par. Before that his smile is

a little too weak to put real sweetness into the ripening fruit. A narrow strip of wire netting, fastened around the rim of each pot, will hold the fruit up and keep it clean if the pots are placed on soil.

Almost any variety may be grown, but it is better to select one that makes fairly strong crowns, and with good stiff stems that will hold the berries up.

## CHAPTER XIV

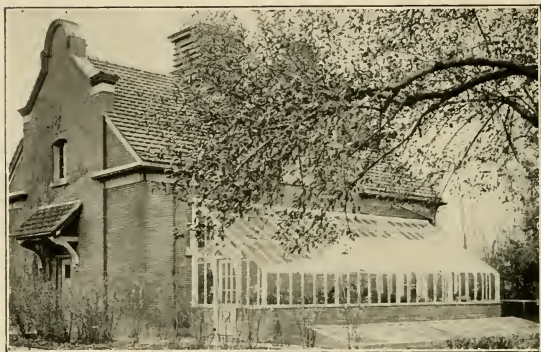
### THE KIND OF GREENHOUSE TO BUILD

THE builders of modern greenhouses can tell you perhaps everything you want to know about how to build and when to build, except one thing, and that *you* must know first. It is: What do you want with a greenhouse?



There is available anything from the little built-in lean-to, which is really a living room in which you can have plants, to a real "range" with special houses for different kinds of flowers and fruits. But do not for a moment make the fatal mistake of thinking that because you may not have the room, or time, or bank account for the latter, the former will not be worth while. The real joy that you will get from your glass garden will depend upon you and your love for plants. I know places where there are thousands of feet of glass, kept by handsomely paid gar-

deners, which the owners seldom enter except to show them off to visitors. On the other hand, I know of a range where the owner is a collector and enthusiast, and is literally jealous of the time his "Orchid man" has to put in there,



As the first step toward greenhouse getting, decide just what you want to do with your glass garden. Secondly, get in touch with real greenhouse builders to help you work out the details of planning it.

time he cannot afford to take himself. I have also seen dozens of conservatories and small houses where the owner did practically all of the work himself or herself; where you could see, the moment you poked your head inside the potting shed, that every nook and corner was filled with the joy of gardening and of growing things.

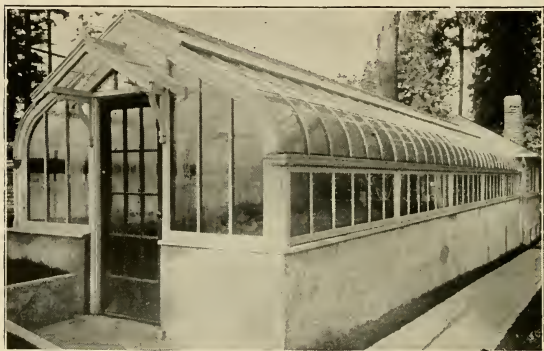
It all depends on what you want to do with a greenhouse. And when you have decided what will best fit your purpose and your purse, you will have some of the following points to consider:

*The Greenhouse to Fit the Place*

First of all, a greenhouse must fit into your place, and link up with the other buildings in fairly harmonious fashion. You do not want anything, whether large or small, that will be an excrescence! Of course you must put the house where it will get an abundance of light; that is absolutely essential. It may fit into a nook or jog in the house; be built into the veranda; or made part of one of the boundary walls; or even be almost concealed in a pergola!

Modern builders of greenhouses, knowing from wide and varied experience what can be done with curved iron frames and glass, can make a greenhouse grow where one would have thought it was impossible. And where they are put, they stay put—they will remain there during the life of the dwelling house itself. That is, of course, assuming that the best in construction is used. In most things you buy, as you have probably discovered, the best is the cheapest. That is more so with a greenhouse than with anything else you can buy.

On the other hand, there is some danger of going too far in trying to make the greenhouse fit in architecturally with the rest of the place. If you leave the designing of it to the architect alone, he is very likely to sacrifice economy or



No place is too small for a glass garden. It will fit into some nook or corner, or may even be made part of the boundary line.

growing quality, or both, to the "lines" he wants to get. The best way is to have the best greenhouse people collaborate with your architect to secure something that is right both ways.

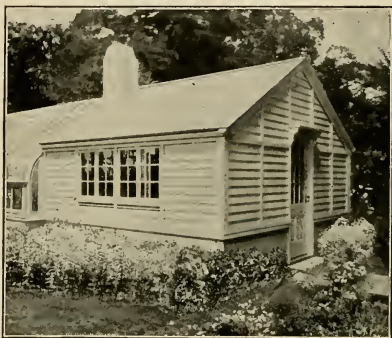
And there is another thing worth considering and will be a saving of hundreds of dollars. If you are going to have a greenhouse, get a "standard built" one, that is, according to a standard specification. You would never in the

world think of ordering an automobile with the wheel base made three or five inches longer than the ones the manufacturers of that car turned out. Just so with greenhouses. Manufacturers who have turned out thousands of houses are pretty well able to judge what is the most useful and economical width for a certain kind of type of house; how wide the walks should be; just what heating is required, and so forth. They will sell you such a house complete in every detail, erected and ready to fill with growing things the day it is completed, at a price hundreds of dollars less than it would cost to have one made a few inches wider, or higher at the eaves, or differing in some slight detail.

As for heating equipment, get that with your house equipment, *designed for greenhouse work*. Don't make the mistake of letting the local plumber put in something that will not turn out satisfactorily. House heating, with which he is familiar, is all up and down; but greenhouse heating, on the contrary, is back and forth—entirely different conditions.

Let the people who build your house specify the heating at least. Then you can't go wrong even if you have a local man put it in. It is best, however, to let the builders complete the whole job.

Maybe, however, you want the fun of erecting your own house, if it is a small one and you are handy with tools. This can be done. It comes to you with all parts cut and marked for you to



The potting shed (or "workroom" if you prefer) is as great a joy as the greenhouse itself—in fact, the glass garden without one is only half a garden.

put together. Then, too, you can save something on the cost that way—provided, of course, that you charge your own time up to exercise. I have built three houses myself, and it is a lot of fun, but if I was buying another house to-day I think I would let the manufacturers put it up. I am sure I would if it was one of any size, because I know they can do it better, and it is almost as important to have a greenhouse ab-



olutely tight as to have a boat tight. The moment the house begins to "leak," the heating cost goes up and can never be brought down again.

*Why a Workroom Is Necessary*

One of the biggest of all the joys of the glass garden I have barely mentioned at all so far.

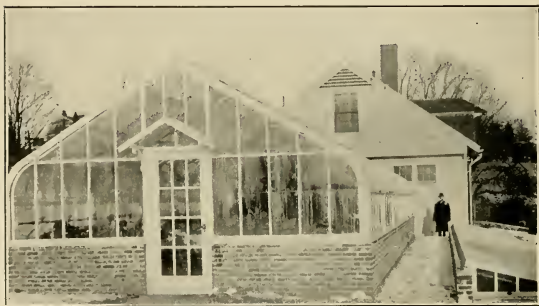


Glimpse in a greenhouse workroom where the planting of the seed flats, transplanting, re-potting, and so on is done. Many a happy, carefree hour is spent here in such fascinating work.

That is the "potting shed." The "workroom," some call it.

I remember how I used to stop on the way home from school for a breathing spell, out of the snow or rain, at the greenhouse on the way.

How good was the odor of the moist soil when everything was frozen up outside! How pleasant was the smell of the soft coal smoke down the road, that meant they were beginning to "fire up" in the early fall days! Until you have had a potting shed to greet you when the



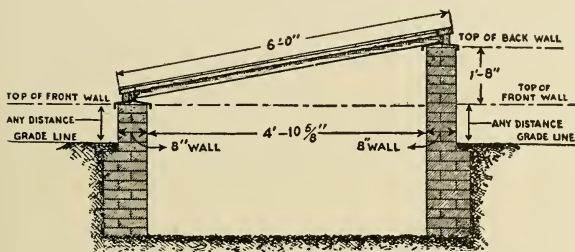
And finally—have plenty of frames! Costing but a trifle, they will increase greatly what you can grow in your greenhouse.

fall days begin to get dreary and chill, you cannot imagine just what it is to have a little place of this kind to retreat to, where everything is snug and warm, where the smell of the freshly kindled fire among the things you have transferred to your winter garden brings assurance that they will keep on growing, no matter how hard a frost the night may bring.

It won't be long before the potting shed will be one of your favorite haunts.

### Have Frames in Plenty

In addition to the greenhouse itself, *have plenty of frames!* Not just two or three, but a string of them as long as the house itself. Often

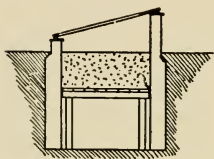


If you want your storage pit to last, make the walls of masonry with cast-iron sills on top and cypress frame and sash. Such pits are invaluable for storing semi-hardy things like Azaleas.

it is a good plan to have one such a deep frame that can be heated from the greenhouse heating system enough to keep out frost. And in addition to this, a similar size coldframe. It is remarkable how the capacity and uses of the house will be increased by this slight supplement.

You will find the frames indispensable for plants such as Lettuce, Beets, and Bulbs that are to be brought into the greenhouse later; for

storing vegetables, roots, such as Asparagus, Rhubarb, and for Strawberry plants in pots, or the like; for keeping half-hardy things in the winter, and again in the spring for setting out



This shows how part of a pit can be easily converted into a coldframe or hotbed by using a bench for the soil.

plants which have been started early in the greenhouse, thus beating the outdoor garden by several weeks—for all these and many other purposes. It is unnecessary to enlarge here on the work in the frames—that is done in other books and pamphlets

of various greenhouse concerns who make frames of all sizes from the small ones called melon frames to the standard sizes using sash 3 feet wide and 6 long.

## CHAPTER XV

### HANDY AND HELPFUL ACCESSORIES

EVER try to lace up a shoe without a shoe lace? A shoe lace is a little thing, but when you try to do the job you are supposed to do with a shoe lace with something else, you begin to realize what a handy thing a shoe lace is. The same way with the little things you need around the greenhouse. It has always surprised me to find people trying to putter along, content to do without a fairly complete equipment of these little things. Some of these have been mentioned already. But to round them all up together and see at a glance the things that the potting shed should contain, I have put them here with a few very brief remarks on each.

Before you have gone very far with your greenhouse you will find yourself thoroughly interested in having your potting shed complete; and even add a little zest to it by playing that old game, "a place for everything, and everything in its place." Incidentally, it is a good plan to work out a color scheme of your own, and paint

everything that is likely to be begged, borrowed, or stolen. You will find that this will be a great help to your friends' memories. It is a convenience sometimes to be able to identify your own things when you find them, without having to question anybody's good intentions or bad memory. Now as to what you want.

### *Soil Ingredients and Fertilizers*

**PREPARED SOIL.**—For directions for mixing see page 40. Keep a good supply ahead in barrels, or in a bin under the work bench.

**ROTTED SOD.**—Some of this kept separately will be handy for many uses. Have plenty of it on hand each fall, to see you through the winter and early spring.

**LEAF MOULD.**—Gather a supply of this from the woods in autumn. Get it where it is best—way down under the top leaves. A barrel will hold a surprisingly large amount of it when you get it packed tight.

**HUMUS.**—This is finely pulverized, resembling an extremely light, fine soil. It comes by the bag, or ton, and is a fine thing to have on hand, especially when you can't get leaf mould.

**PEAT.**—This is used for many purposes, particularly for growing Orchids and the like. It can be bought from a florist or seed house.

**SAND.**—Good, clean builders' sand. Medium-size grains, and grit, used for rooting cuttings, and also to make soil friable.

**BONE MEAL.**—You have more use for this than for any one fertilizer. Get some of the coarse, raw bone, called "rose-grower's" bone, and some of the bone flour. Use the latter where quick results are wanted. For soil in benches and in potting up, use in proportions of about half and half.

**SHEEP MANURE.**—It is very good when you can get the genuine article. Commercial manure should be used with care. Cow manure, while not as strong, is staple for many purposes. Tankage and dried blood contain more nitrogen than bone, and are used for many purposes, especially for top-dressing flowering plants.

**NITRATE OF SODA.**—The quickest of all fertilizers. Good for stimulating leaf and vine growth, and bringing along backward plants. This should be used as a liquid, one tablespoonful to three to ten gallons of water.

**FERTILIZER COMPLETE.**—A special "Greenhouse Mixture," containing 5 per cent. of nitrogen, 8 per cent. of phosphoric acid, and 3 per cent. of potash, made up from the best materials, is put up by the Nitrate Agencies Company of New York.

*Tools and Plant Helps*

**TROWEL.**—This perhaps occurs to you as the first tool the gardener will get; but it is in only



Of course you need a trowel. Get a good one that can stand a little prying without crumpling up or the handle loosening.

one greenhouse out of twenty that you will find a really good trowel. They are made, but you may have to try several

places before you succeed in getting one. The kind that are ordinarily offered are not worth carrying home. Get a good one, cut your initials in it, and enjoy it for years.

**TRANSPLANTING FORK.**—The little, short-handled fellow with broad, flat prongs. You never know how handy this is until you try to get along without it, after you have had one.



**DIBBERS.**—You can buy one, or make one yourself out of a nice piece of wood. It is handy to have a couple on hand.

For transplanting small plants use a sharp-ended stick or dibble. Here is one with a curved handle and metal-shod end which costs but little and lasts your lifetime.

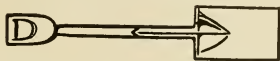
One with a point not much bigger than a lead pencil for transplanting small things; and a bigger one for cuttings and the like.



**FLOAT.**—This is nothing but a flat piece of wood convenient in size, with a handle on one side. It is used for pressing the soil down in flats, or making the ground level before planting, or after seed sowing. Just one of the little things that help speed up work, and which is also fun to use.

**SPADE.**—Get a good one, the best you can buy.

Metal strip on the handle—front and back. Keep it clean. Wipe off with an old rag when you are through using it. You



No need to tell you the uses and need of a spade—a spade, not a shovel—suffice that you can't "keep house" without it. Get a good one and you'll never need to buy another.

will find as much difference between using a clean spade and an old rusty one as between a sharp and dull razor blade.

**SPADING FORK.**—The kind with four or five flat teeth. This is handier than a spade for digging up solid beds and breaking up lumps, etc. Some remarks as to quality apply here.

**SIEVES.**—You will need at least two, a fine and a coarse. They are made up of extra-heavy wire for florists' use. Obtainable from any seed house.

**WEEDERS.**—Cultivation is as necessary under glass as out in the open. In addition to a "finger" weeder to use in the hand, it is well to

have one on a handle for getting into the middle of a solid bed if necessary. A light, small hoe is also suitable for this work.

**PLANT SUPPORTS.**—For Carnations, Roses, and other things. Get a supply of the galvanized wire ones. Sticks are inconvenient and always breaking when you don't want them to. There are several different good ones. Described in any seed catalogue that lists greenhouse supplies.

**RAFFIA.**—This is a dried, tough fibre used in place of string for tying up plants, etc. Doesn't cut the plants as string does. It is soft, convenient to tie, and does not quickly rot.

**LONG SCREW EYES.**—These are used for supporting wires and trellises at a distance of six inches or more from the side walls or roof bars, where Tomatoes, Melons, or Grapes are to be trained. Keep a supply on hand.

**SHELF BRACKETS.**—These are designed to fasten to the roof bars, to support board shelves for holding pots when the houses are temporarily crowded, or to hold seedlings, Strawberries, or other things which it is desirable to get as close to the glass as possible.

Other brackets are designed to go on the *side* walls, or to fasten to the supporting upright posts to carry temporary shelves. It is a good thing

to have these on hand, as they often save overcrowding on the benches, with the result that plants which would otherwise have to suffer or be discarded can be kept in perfect condition until there is more room available. They are especially useful in the spring, just before it is warm enough to put things out into the frames.

**LABELS.**—Don't forget these. You will probably have most use for 4-inch labels. A few of the long, narrow ones will come in handy in all sorts of ways. A few wired labels which you can tie on the tops of bamboo sticks for use in



To reach all the plants on the greenhouse bench you need a long-necked sprinkling can. Get a good one, galvanized. Use it the first season, then paint it and you can hand it down for your children to use.



Watering hose has a way of wearing out and springing leaks at the kinky places. If you have these jiffy hose menders on hand all you need do is cut out the poor spot, push the ends over the metal necks and hammer down the prongs.

bulb pans, to separate the varieties when they are covered with soil, will also be handy.

**INDELIBLE PENCIL.**—Along with the labels get

a pencil that will write readily and won't wash out. Ink, of course, is no good, nor an ordinary lead pencil.

GLASS CUTTER.—There will be occasions for cutting glass. You often need a piece of glass, and a moderate-size cutter will save a deal of exasperation. To cut glass, lay it on a perfectly smooth surface, and then hold a straight edge where you want to cut. Draw the cutter wheel *once* with a steady, firm pressure. *Never* try to cut over again on the same place. After you have marked the surface, turn the glass over and tap very lightly along the line with something light and hard. The glass will then part readily.

## CHAPTER XVI

### AROUND THE YEAR IN THE CRYSTAL GARDEN

IT IS not only during the siege-time of winter, but every month, every week, that there are things of absorbing interest to do in the garden under glass. As many of the most joyous achievements with flowers and vegetables have to be planned for a long time before, this little "round-up" of greenhouse activities is presented for the benefit of the beginner—a sort of guide, philosopher, and friend in reminder form. Just some of the most important things which should be given attention from time to time, to keep everything running smoothly, so that you will not occasionally find yourself saying, "Why didn't I think of that when it was time to sow the seed! Now I'll have to wait another year!"

The following is by no means a complete list of everything that can be done; but it is enough to help in the right direction. Make a practice of dropping in to see your friends, and your friends' gardeners; and keep tabs on what they are doing, so that you can pick up all the new

“wrinkles” that develop. And if you make these little pilgrimages with an open mind and a not too intrusive disposition, you will find yourself gathering bits of valuable information here and there that will enable you not only to do new things but to do old ones better.

Keep a little diary of your greenhouse activities. You will find it a lot of fun to do this once you get the habit. And the record will be invaluable to you when you have completed the circle of the year’s work, and start in again next year.

### *January*

First: Send for the dealers’ new catalogues! I don’t know where you can get so much fun and information for your money as from the average seedsman’s, florist’s, or nurseryman’s catalogue. It is a good thing to have books and magazines; but for the latest news in the plant world you must go to the catalogues.

And then there are the various helpful booklets which are published by the greenhouse concerns, and by the manufacturers of tools and insecticides, etc. A good collection of these will form one of the most valuable parts of your library.

Prepare soil for starting seeds. See page 39.

Make up flats and boxes and buy seed pans so as to have everything in readiness for sowing. There will be more seeds to sow during the next few weeks than at any other time in the year.

Testing old seeds. This may be done readily by counting out a score or a hundred seeds, and planting in the ordinary way. Then keep track of the percentage which grow. This test may save you many disappointments with flowers and vegetables to be sown outdoors later. Forewarned is forearmed!

Vegetables for forcing. If you have only a one-temperature house, Cucumbers, Tomatoes, and Melons to be grown inside later should be planted this month or next. If you have both a high and a low temperature house, successive planting of the various vegetables can be made now, to keep up the supply.

Bring in fruits in pots or tubs for extra early use. Also Strawberries. Unless you have a regular fruit house, however, most of these should not be started until a little later.

Start seeds for plants for next Thanksgiving and Christmas. Ardisia, Solanum, Abutilons, Fuchsias, Grevilla robusta, and similar things requiring the greater part of a year to mature, should be started now for growing through the summer.

Start annuals for cutting under glass. Very often there is a bad lapse between the last of the good indoor flowers and the first of the garden outside. To bridge this gap start now a good supply of Asters, Clarkia, etc.

Bring in hard-wooded plants. Lilacs, Hardy Azaleas, Clematis, Laurels, and other plants set in pots, or which have been stored for forcing, may be brought in now—a few at a time to give a continuous supply.

Start a new crop of Sweet-peas for late spring flowering to keep up the supply until the first blooms are ready out of doors. Use a greenhouse variety.

Start into active growth stock plants and greenhouse plants to make material for cutting. Old plants of Geraniums, Begonias, Heliotropes, etc., cut back quite severely now, re-potted and given a little more water, will “break” to new growth, making ideal material for cutting a few weeks hence.

Keep fall-rooted cutting coming on without a check. Young plants started last fall, if they are allowed to get pot-bound now, will be severely injured. It is not desirable to force the growth during the winter months but they must be given enough water and shifted frequently enough so that they will keep growing. Dry off and rest



plants that have been working hard through the winter. This applies especially to plants grown for the holidays such as Poinsettias, Azaleas, etc. Gradually reduce the amount of water and if possible move to cooler quarters. When dormant they may be stored under a bench. Place on their sides if there is danger of water leaking through from on top—until time to start into growth again.

Keep flowering plants well fed. Carnations, Roses, Snapdragons, and other plants from which you have been cutting heavily will need frequent top dressings to maintain the size and quality of flowers. See Chapter VII on Fertilizers.

Divide old plants and re-pot. Plants such as Begonias, Daisies, Geraniums, and Ferns may be divided now into several smaller plants, re-potted, and started on the way to make fine new plants by spring.

### *February*

Go over the list of January activities and take up any which have not been attended to.

Dry off and rest holiday and mid-winter plants such as Azaleas and the like, which have come to the end of their flowering time.

Start stock plants into active growth to furnish the materials for cuttings later.

Overhaul Ferns and other ornamental foliage

plants. Within a few weeks they will begin their new growth, and on that they will have to depend for their beauty next winter.

Toward the end of the month a few cuttings may be made from such plants as were started into active growth last month. Geraniums, Paris Daisies, Salleroi Geraniums, Heliotrope, started now will make fine big plants for setting out as early as possible in the spring. If you are carrying any Coleus through the winter, give them the warmest spot available.

Sow seeds of Pansies, Daisies, Annual Phlox, and the like.

Sweet-peas started now, two or three seeds in a pot, can be re-potted two or three times and will be strong, husky plants to set out late in March or early in April, as soon as the ground can be dug. They will give flowers weeks ahead of the seeds sown outside.

Start this month Cabbage, Beets, Lettuce, Kohl-rabi, Onions, Cauliflower, and Celery for extra-early crops.

Fruits and Strawberries taken in last month should be making good growth now. Syringe frequently and keep well supplied with plant food and water.

Make another planting of Gladiolus bulbs inside for early spring bloom.

Take in cut sprays of early-flowering shrubs and put in water in a warm place to flower. Just as they are breaking into bloom they may be removed to the living room.

### *March*

Start Eggplants, Tomatoes, and Cauliflower for outdoors early in the month.

Melons, Cucumbers, Squash, Lima Beans may be started in seed pans or flats for transplanting later for a summer crop in the greenhouse.

Make adequate sowings of such annuals and perennials as Begonias, Pansies, Petunia, and any other which are wanted and have not yet been sown.

Start bulbs now to pot up later for summer bedding such as Cannas, Begonias, Tuberoses, Caladiums, and the like.

Pot up cuttings put in the propagating bench last month as soon as roots begin to form.

Unless ample supplies of Carnations, Chrysanthemums, and Snapdragons are already started, make another batch of cuttings now.

Be sure to keep Chrysanthemums shifted as often as necessary to larger pots to obtain strong, rapid growth.

Re-pot Carnations so as to get stocky plants for setting outside next month.

Be sure to get supports ready well in advance for Grapes, as the new growth will be exceedingly rapid when it begins. Same for Cucumber and Melons that may be making a start now.

Be sure to label every plant carefully.

### *April*

Transfer from the greenhouse to frames, for hardening off, all the "hardy" vegetable plants and bedding plants. Follow these, as soon as the weather is warm enough, with the tender plants. Ordinary sash will keep them safe from several degrees of frost.

Set out, inside, Cucumber, Tomatoes, Egg-plants, Melons, etc., for extra-early crop under glass.

Sow seed, inside, of Peas, Sweet Corn, and such other tender vegetables as there may be room for.

Pot up the bulbs started last month into three- or four-inch pots, using good rich compost so as to have strong growing plants to put outside next month.

Re-pot plants in small pots, and give plenty of room to pots on the benches as growth is very rapid now and over-crowding quickly does serious injury.

Pot up last cuttings of Carnations, Chrysan-

themums, and the like, and re-pot plants already established.

Increase rare varieties of Dahlias by cuttings. Be sure to make the cut just below a joint, as otherwise the plant will not form bulbs during the summer.

Roses may be set out inside as soon as there is room. They are grown on inside during summer for fall and winter bloom.

Water only *around the plants* at first, instead of soaking entire bed.

Keep sulphur paste painted on pipes, especially during damp, muggy weather.

Make up window boxes, hanging baskets, vases, etc., so as to have the plants well established and growing before these are put outside next month. This saves the three or four weeks while the plants are getting a start if they are set in the boxes outside.

### *May*

Move things outdoors or to the frames as rapidly as possible.

Keep plants which are left in the house picked up and placed close together so that they will not be neglected or dry out too rapidly.

Attend to watering with the greatest regularity. Do not let up on fumigating, watch for

insects closely, as much damage may be done in a few days if they get a start.

Plant Melons and English Cucumbers to help keep the house full during the summer months.

If already started in pots or planting boxes, move these into their permanent positions.

Re-pot plants for flowering for next fall and winter. Keep pinched back so as to make good, stocky, shapely plants. Transfer these plants to the open as soon as possible, plunging pots in gravel or sifted ashes to hold them in position and conserve moisture. Re-set occasionally to keep roots from going through the pot.

Start sod pile, to make sure of plenty of good soil for next fall.

Dry off Callas, Oxalis, and other bulbs that have been blooming through the spring.

Grapes will be growing rapidly now; keep pinched back every day or two. Remove growth of laterals beyond bunches.

Secure a quantity of young Ferns to grow on for winter and fall. If you have a surplus they make most excellent gifts.

Set outdoors: Carnations, Snapdragons, and other things to be grown on for planting inside in fall. Set out stock plants, and in fact anything which will do as well in the open ground during the summer.

Make as much room as possible inside, and then utilize it. Anything that can go out will require less care outside than in.

### *June*

Clean out the house, or sections of it, and repaint or sterilize preparatory to putting in new soil or new crops. This is the best time to do any repairing there may be needed.

Sow for next fall and winter *Begonias*, *Snapdragons*, *Heliotropes*, etc.

Put in *Roses* if not already planted.

Procure shading material and shade part of the house for such things as do not like full sunlight—*Ferns*, *Palms*, and other decorative foliage plants.

Make sure of plenty of “greens” for using with cut flowers next winter. Small pot plants of *Asparagus* and *Smilax* started now will make fine sprays by next autumn.

Give extra feeding to *Tomatoes*, *Melons*, *Cucumbers*, and other things which may have been producing for some time.

Tree fruits will also require special care in the way of feeding at this time.

Thin *Grapes* as soon as the little berries are well formed. Don't be afraid of overdoing it.

*July*

Get in fresh soil and make everything ready for putting in the Carnations. This may be done any time during the month but preferably when several rainy or cloudy days seem likely. Spray thoroughly if they have to be brought in during bright, hot weather.

Chrysanthemums will be making excellent growth now and should be fed two or three times a week. The oldest plants should be in eight-inch pots. Give plenty of air and spray very regularly to keep down the insects. Keep up feeding till buds show color.

Start Callas and other winter-flowering bulbs.

Sow seeds of Pansy, Clarkia, and other things for fall and mid-winter.

Give regular attention to plants outside. Pinch back and get into shapely form Oleanders and all the other things to be brought in for winter flowering. Be sure they are kept clean from all insects and pests.

Make a sowing of Lettuce and Tomatoes for first indoor crops in fall.

*August*

None too early to begin to get everything in shape for fall. There are likely to be a few days



and nights when a fire will be needed—in fact, whenever much cold, damp weather comes, an occasional fire to keep the greenhouse warm and dried out will be a benefit, especially in warding off mildew.

Look over heating apparatus carefully and overhaul if necessary.

Be sure that the soil pile is ample—in connection with even a small house one uses a lot in a year!

Start regular vegetables and flowers for winter in quantities required.

Re-pot Strawberries so as to get fine, big, strong crowns to store during early winter, and force later.

Plant Sweet-peas the latter part of the month for growth inside.

### *September*

Start in frame or in cool-house, so as to keep up supply of Beans and Radish from seed, and transplant Lettuce, Tomatoes, and Cauliflowers started last month. Some 60 degrees temperature must be maintained during November and December to grow Tomatoes.

Take in stock plants from outside before danger of frost. Snapdragons, Geraniums, Heliotrope, and many other things, cut back rather

severely, and put in, will make good growth and flower again profusely later on.

Start seeds of Snapdragons, Clarkia, Stocks, and any other things wanted which are not already available.

Procure and plant for growing under glass Gladiolus, Oxalis, Caladium, Callas, Begonias, etc.

Plant in flats or bulb pans, for forcing later on, Tulips, Hyacinths, Narcissus, Crocus, etc. These may go in during the latter part of this month or in October. Lilies should be started the first part of this month.

### *October*

Continue to give best attention to Chrysanthemums. Fumigate or spray thoroughly, and give plenty of fresh air. Maintain even temperature.

Make another planting of any of your favorite annual or perennial flowers not already well provided for.

Pot up cuttings put in sand last month, as soon as roots have formed. Give final shift to plants grown through summer for winter bloom. Use plenty of bone and ashes in soil, but not too much nitrogen. Make successive plantings of vegetables.

Any shading still remaining on the general-

purpose house should be removed, as from now on all the sunlight possible will be wanted.

Sudden cold nights may be expected now, and of course keeping the fire in first-class condition should not be overlooked.

*Never let the ashes pile up to the grate.* Clean out regularly. Keep flues clean. Do not wait till the sun goes down at night, but start fires early enough to get the pipes hot just before the sun leaves the glass, so that there will be no sudden drop in temperature.

### *November*

Before ground freezes take up roots of Asparagus, Rhubarb, Chicory, etc., wanted for forcing.

Keep an eye on bulbs stored outside, or in frames or pits, and protect before danger of freezing. Be sure not to put where mice can get at the bulbs.

The houses will have to be kept closed more now, and the appearance of all insects should be watched for most diligently. Fumigate regularly, so as to keep them out. Take advantage of every bright sunny day to give all the air possible, while maintaining the required temperature. The more air the plants can get without danger of a chill the better.

Days are short and growth is at its minimum during this month and the first part of next. Water carefully, as over-watering now may mean that soil will be soggy for several weeks, with resulting injury to plants. Top-dress vegetables and flowering plants with nitrate of soda or other nitrogenous fertilizer, as the nitrogen in the soil does not become available so rapidly for the plants' use during this period of short days.

### *December*

Bring in from frames or cellar early bulbs in flats or bulb pans to be forced. The early varieties, like Golden Spur Daffodil, do not need to be frozen before forcing. They can be brought into moderate temperatures, say 50 degrees, after they have made a mass of roots. Water sparingly at first, and more generously as vigorous growth begins. They can be started under a bench or in a shady place, but should receive full light as soon as the flower buds begin to show.

Fumigate, or paint the heating pipes with sulphur as a preventative against mildew which does serious damage and is fostered by mid-winter conditions.

*Astilbe japonica* makes one of the most attractive plants for forcing. Clumps should be potted up now and given enough heat to start

growth gradually so they will make good strong plants for flowering later on.

It is not too late to put in a last planting of Lilies for Easter bloom. Good strong bulbs of *formosum* potted now will flower in time.

Attend to winter protection of coldframes and hotbeds. Frames that ought to be kept warm should have boards placed upright and held in place by stout stakes about six inches outside of the frame. The intervening space is packed with dry manure. Shutters, or reed or burlap mats placed over the glass will afford a good deal of extra protection.

Watering should be done sparingly during the short mid-winter days so as to avoid getting the soil in a wet, soggy condition. A thorough spraying of the foliage in place of watering can be used to advantage under these conditions, as it will keep the plants fresh and vigorous without the danger of over-wetting the soil.

Pot up as soon as ready cuttings of Carnations, or other flowers which have been made during the past few weeks. One of the commonest mistakes with cutting is to let the roots get too long in the cutting bed before they are potted off. Be on the watch to avoid this.

Start into growth stock plants of Chrysanthemums held over after the fall crop. Keep

sprayed with Black Leaf 40 to prevent the black aphid from getting a start.

Start now clumps of Rhubarb or Asparagus for forcing. These may be grown under a bench or in some other shady place as well as in the light. The clumps that have had several weeks freezing preparatory to being brought into heat give the best results.

It is not too early to start a batch of cuttings for spring bedding plants, particularly of new or scarce things of which it is desired to work up a stock for spring planting. They will root readily during this month if not given too much water.

Start into active growth for the production of material for cuttings next month stock plants of Geraniums, Heliotrope, Fuchsias, Ivies, Daisies, and other things which will be wanted in quantities for spring.

Sow seeds of Annual Larkspur for early spring blooming under glass. This is one of the prettiest of all flowers for cutting inside during the spring months.

Make another planting of Gladiolus bulbs for bloom inside. Include some of the Primulinus Hybrids which are particularly desirable for cuttings for table decorations.

Make a first sowing of Pansies, Daisies, Forget-

me-nots, and other spring bedding plants for extra-early use.

Select carefully the best Chrysanthemums to keep for stock. The plants can be kept under a bench or out of the way to start into growth the latter part of the month, or the first of next month, to get material for cuttings for next year's plants.

Keep soil in all beds well loosened up. Occasionally loosen the soil in pots, plant boxes, or large pots. The forming of mould or moss closes up the surface so that air cannot readily penetrate to the plant roots.

Start Tomatoes and Cucumbers in a frame or over bottom heat, to furnish plants for setting out next month. Set where a sufficiently high temperature can be maintained during January and February to grow them.

Watch Carnations and other plants for any kind of disease. Immediately remove any rusty or spotted leaves *and burn*.

Do not be in too much of a hurry to force semi-dormant plants like some of the flowering shrubs into active growth. Give them a chance to finish a comfortable rest period.





**PART II**  
**CULTIVATION OF SPECIAL CROPS**



## CHAPTER XVII

### ALL ABOUT VIOLETS

PROCURE northern-grown plants as early as possible in spring. They may be had out of two-inch or two and a quarter-inch pots. Pot up in slightly larger pots than those in which they were grown, place in a cool greenhouse or frost-proof frame on sifted ashes. Keep all pots level so that they will hold water when needed. Keep them in a night temperature of 40 degrees.

Violets grow best in a sandy loam.

Ventilate early in the day, and a little at a time, increasing as the temperature increases. Maintain a temperature of 55 degrees by day, and if in a frame, the sash should be removed and replaced in the afternoon as soon as conditions make it necessary. When danger of frost is past, the sash had better be kept off altogether.

They should be planted in the field about the end of April in the latitude of New York. Set the plants about twelve inches in the row and for hand cultivation two feet between the rows. Cultivate at least every two weeks and at the

same time go over the rows and cut off all runners within two inches of the plants—the object being to secure single-crown plants.

At this season—spring—get the soil ready for the plants for frames or greenhouses. Top sod four to six inches thick is best for this purpose with one third cow manure added in alternate layers on a heap.

Break up this sod pile in August and add one and a half pounds of pure ground bone to each bushel of soil. Do not break up the soil too fine as the rough pieces may be placed in the bed where the plants are to grow, at the bottom. This should be six inches in depth. Level off the bed and mark it off in lines eight by ten inches.

If the plants are to be grown in frames give the matter of drainage proper attention. If the sub-soil is of a sandy nature, nothing need be done but place the soil on it, as already mentioned, otherwise use cinders which have been exposed to the elements for some time, as fresh cinders contain too much sulphur. If to be grown in frames select, if possible, a southeasterly aspect, where also they may have some protection from northerly winds.

In lifting the plants, try and have it done in the morning if the weather should be clear and

warm, and plant as soon as possible. Protect plants from sun and winds, as they may wilt.

It is well, before placing the plants in the beds, to shade the glass with whiting or clay. If in



Among the hundred and one things you can grow in coldframes, Violets are not the least. Blooms you can have for months and months from fall till spring.

frames, use lath shades, as they may be removed every afternoon as soon as the sun is off the plants. This will start them quicker. They should be left on for about ten days or until such time as the plants are in good growth. Begin by leaving the shades off a little longer each day after the first two weeks. For example,

place shades on the sash at 9 A. M. and remove at 4 P. M. Next day, one half hour later in the morning and remove one half hour earlier in the afternoon.

After planting, leave two inches of air on sash for a day or two and gradually increase each day as the plants show signs of active growth. Syringe them mornings and early afternoons for about two weeks, after which once each clear day early in the morning.

As soon as plants are planted, water thoroughly. They may not require more water for about five days, depending on whether the soil is of a sandy nature or of a clay nature. In making lath shades for this purpose, nail ordinary builders' lath on two two-inch strips one inch apart. It is best to do this on the edge of the strips for two reasons: first, they hold together better, and second, they allow more air space between them and the sash, thereby keeping the plants just so much cooler. These shades may be four feet wide and six feet long.

Planting in eastern New York and New Jersey may be done about the end of August.

Cultivate the beds about every two weeks and not over a quarter of an inch in depth, as most of the feeding roots are near the surface. Keep all runners off, also all flower buds, the

latter till the first week in October or a little later, depending on circumstances. The object of this is to encourage root action, so that the plants will go into winter in good growth.

As winter approaches, syringing may be done two or three times a week according to weather conditions.

Maintain a night temperature of 42 to 45 degrees and 55 degrees in clear weather by day. Should the foliage be wet in the evening after syringing, leave some air on the frame or greenhouse and turn on a little heat. This should be done irrespective of weather conditions at the time, as otherwise they may get what is commonly called leaf spots, or blisters.

In watering the plants, always do it in the morning and be sure the soil is wet through to the bottom of the roots. Before watering the plants, examine the soil under the surface. If it should hold together when squeezed in the hand, there is sufficient moisture. On the other hand, there may be spots where the bed will dry out more quickly, in which case water where necessary. To water them properly, go over the beds twice, as otherwise the best elements of the soil will be washed out, so that a little patience is time well spent.

Toward the end of January the plants may

require a stimulant. A light application of pulverized sheep manure between the plants will be of much benefit. Avoid chemical fertilizers at this season of the year, as they are too quick in their action, and since full ventilation cannot be given the plants may be destroyed.

A word on fertilizers may be in order, in that it is always good policy to get the bulletins issued by the State Experiment Stations, showing the analysis of the different brands. One can feel safe in accepting these reports. Of course those with experience know which are the most reliable, but it is good practice to have the bulletins in any case, as they are issued to any one who applies for copies.

Should the soil at any time show a tendency to become green, a slight dressing of slacked lime may be given, thus correcting the acidity of the soil, also making the bacteria more active. Lime must never be considered as a fertilizer. Its use on soil is for the purpose above described.

The best guide in determining when to stimulate the plants is one's own observation that the flowers show signs of not being up to standard. Be cautious about applying stimulants to Violets as they are not gross feeders like Roses.

Enemies are: red spider and green fly. The presence of the former may be known by the



appearance of the leaves, in that they become white, as a result of the tissues being destroyed. They are in appearance and size similar to unripe red peppers. Remedy: they may easily be kept in control by syringing properly with cold water applied to the under side of the leaves, using a fine nozzle with a pressure of at least thirty pounds. Green fly may be kept in control by fumigating with either nico-fume paper or vaporizing in the liquid form. All open flowers should be picked off before fumigating. This operation should always be done at night, whereas the syringing should be done in the morning of a bright day as far as possible. The best remedy for green fly is cyanide of potassium used in conjunction with sulphuric acid, but this is an extremely dangerous vapor in inexperienced hands.

Violets may be grown successfully in southern New England, eastern New York, and New Jersey, without artificial heat, by using a double frame and also double-glazed sash, with mats of straw or other material with board shutters to keep the latter dry.

Build a frame in the usual way in a unit of one, two, or more sash as needed. Have the back of the frame about twenty inches high and the front twelve inches in height. Next, get two-by-

four-inch material and nail on edge from top to bottom on the inside, spaced about four feet apart, after which line the inside with roofing or other matched boards. Thus, a space four inches will be formed all around the frame which should be filled with dry leaves. By this method flowers may be had all winter.

### *Heating*

In placing heating pipes in a violet frame, the return pipes should be placed at the front of the bed with a board stood on edge between the pipes and plants to act as a shield, as the heat coming in direct contact with the plants would cause red spider. As far as possible, hot water should be used for heating.

Short stems are the result of either keeping the plants too warm or too dry at the roots.

At all times, after the plants are planted and in good growth, keep the atmosphere buoyant, as Violets are cool-loving plants, and a humid atmosphere invites disease and consequent disappointment. This is one of the most important parts of success in violet growing.

Varieties: Single—California and Prince of Wales; Double—Lady Hume Campbell and Marie Louise.

## CHAPTER XVIII

### ALL ABOUT PINEAPPLES

PINEAPPLES probably are more improved by growing under glass than any other fruit. But unfortunately they take a longer season to mature their fruit—therefore are more of a luxury. Still, for a private establishment, they are to be highly recommended.

The first thing to be considered is a house adapted for the successful culture of this crop, as a great deal depends on success or failure in this respect.

The house best suited for growing Pineapples is a comparatively small, low structure, as they at all times require a fairly high temperature and also bottom heat. There should be enough pipes under the bed, laid in a hollow channel, to keep the temperature of the bed a trifle higher than the general atmosphere of the house. This in particular refers to the dark days of winter. If the roots were subjected to a lower temperature than the top, the chances are the roots would decay and poor results would follow.

Pineapples are of easy propagation. There

are different methods of increasing stock—especially if certain varieties are scarce—such as cuttings of the stem (for instance) after the fruit is gathered. Pull up the plant and strip all the foliage off the stem or stems. Lay into a flat half covered with leaf mould or any open material and place in the propagating house where there is a liberal amount of bottom heat. The dormant eyes will soon start up and nice plants can be had in this manner. Good plants may also be propagated from crowns taken from the ripe fruit. (Allow the crowns to dry out for a few days before rooting them.) These two methods refer to cases of scarce varieties only and when you want to make the most of stock, for strong, vigorous stock suckers that come away from the base of the plants afford the best means of propagation—they make a more vigorous and quick-growing plant. It is well, however, to leave the suckers until they are good and strong before they are pulled from the parent plant. They may then be potted into pots according to size—which for good strong plants should be anywhere from four-inch to five- or six-inch pots for extra-strong plants.

Soil for Pineapples must be of an open nature as anything stagnant around the roots must be avoided. Take a sod land with a fair amount

of sand so that the roots can run readily through it, and if the soil is on the heavy side add more sand, or still better, sand and charcoal. Soil for Pineapples should be prepared a few months in advance, and for every four loads of soil add one load of farmyard manure. When ready for use a sprinkling of blood and bone, say at the rate of 100 of soil to one of blood and bone—such a compost Pineapples should thrive in.

There are different ways of growing this interesting fruit. They may be grown in pots: keep re-potting until they are in eleven- or twelve-inch pots, which is large enough to fruit them in. Years ago most of the Pineapples grown under glass were wholly under the pot system. However, even if grown in pots, if bottom heat can be had, the plants will make a more rapid growth, especially if the pots are plunged into some open material—tan bark, for instance, would be ideal.

Another mode of growing them is to set the plants in solid beds, which is to be highly recommended. The plants make rapid growth under this culture—say about one foot of drainage over the hot-water pipes, then fifteen inches of soil, setting the plants about twenty inches apart. Then the plants may be replaced with young ones after every crop, or the strong

suckers may be allowed to come on again, which will mature a crop much quicker than replanting, although I do not think it advisable to leave them in longer than two or three crops, as the soil they are planted in will by that time need renewing.

In planting young plants, or what I shall term rooted suckers, if everything goes well ripe fruit may be looked for in, say, twelve or fourteen months; whereas in the following crop, providing the plants are in a healthy condition and not disturbed more than cutting the old plants away, allowing the suckers to grow, ripe fruit from these established suckers may be had in nine or ten months, say with a temperature at night of 70 degrees, 80 day or 85 degrees with sun heat.

Pineapples require a fairly light house, although from the middle of April to the end of September a light shade on the glass, just enough to break the hot sun rays, is all that is necessary, and for this purpose there is nothing better than naphtha and white lead.

The varieties of Pineapples are numerous, but many of those formerly included for forcing purposes are now seldom grown, the well-ascertained good qualities of a few leading kinds having gradually led to the discarding of inferior sorts. While the few approved varieties

will be found sufficient for all practical purposes, there can be nothing gained by growing an extended list. Smooth-leaf Cayenne is excellent for greenhouse work, always makes a nice clean growth, and has stood the test many years; when well-grown the fruits will average anywhere from 7 to 10 lbs. Enville, Lady Beatrix, Lambton, Charlotte Rothschild, and Queen will make a select list for forcing purposes.

Water and moisture need consideration. While Pineapples do not require nearly so much water at the roots as some other fruits, it is a mistake to allow them to suffer for want of water. If during the short days of winter they were kept continually wet at the roots, the roots would certainly decay. Years ago moisture was very sparingly given for fear of their damping-off. However, by keeping up the required temperature in the house, also bottom heat, it is not necessary to dry them off during the winter months, but rather a disadvantage, but it has a tendency to weaken the plants and is also a loss of time, as with proper treatment the pines will grow considerably. Of course they will not make as rapid growth in winter as they will during the summer.

In speaking of moisture and watering, also feeding, it is a difficult problem to explain—as so

much depends on the condition of stock. If in a healthy growing state they will take more moisture at the roots. But one thing should be borne in mind: whenever the bed is watered, whether in summer or winter, give it a thorough watering, then no more until absolutely necessary. This, in my opinion, is one of the secrets of success for all plant culture. It would be an advantage through the winter to water and spray with warm water, having the water of the same temperature as that of the house. Keep the atmosphere fairly well charged with moisture at all times and syringe the plants on bright days—but avoid syringing when the fruit is in bloom. After the Pineapples are thoroughly established feeding will be in order, particularly after the fruit is set and swelling away. I have found Clay's Fertilizer excellent for them, say a handful to a three-gallon canful of water, mixed with the water, using enough water to give the bed a fair soaking. Manure water is also good—cow manure preferred. Still this all applies to healthy, vigorous stock. The aim should be to produce good strong plants. Then naturally one may expect fine fruit, which cannot be obtained from weak, puny plants.

Good judgment as regards airing should be used. When the thermometer falls below 80



degrees, for instance, a crack of air may be admitted providing the temperature is in such a condition outside as to raise the temperature inside to, say, 85 degrees. Do not admit air at all if it is going to lower the atmosphere as soon as put on.

### *Insects*

Pineapples are sensitive to insects, although, fortunately, there are not many insects to bother them. Scale and mealy bug are two of the worst enemies. Both are very injurious if they are allowed headway, and are difficult to eradicate. The best method is to keep close watch and upon the appearance of any traces of insects of any kind, to apply methods to eradicate before they gain headway. Where mealy bug has already made headway, use a force pump and fairly hot water. Pineapples will stand water at 100 degrees, but it is uncomfortable for the bug. It is out of the question to clean out bugs by sponging. As already stated, by applying the remedy when first noticed it is easy to keep them down.

Pineapples can be grown successfully by following along these lines, and there is no comparison between the pines grown in the greenhouse and the Southern production. The greenhouse pines can be eaten readily with a spoon, and have a much richer flavor.

## CHAPTER XIX

### PALMS

LINNÆUS, the great botanist, aptly described Palms as the "Princes of the Vegetable Kingdom." Their stately habit, the splendid properties of the stems, the grace and beauty of the leaves, and their great variety mark them as one of the most valuable and distinguished groups of plants.

They are chiefly natives of tropical countries, extending to 36 degrees N. latitude in America, 34 degrees N. latitude in Asia, and in Europe, the one indigenous variety, *Chamaerops humilis*, extends to 44 degrees N. latitude. No species are found beyond 38 degrees S. latitude.

In the United States, while a number of species are to be found growing outdoors in Florida, California, and other more or less frost-free states, their culture is usually under glass, and Palm culture is now a very important branch of commercial horticulture, the number sold of the more popular decorative varieties totalling many thousands per annum.

On private estates also the Palm house has grown to be almost a necessity. It is generally the most impressive glass structure in the range and is full of interest the year through.

Palms are nearly all of comparatively easy culture; arranged tastefully in a special house they always receive the attention of visitors, and are unequalled for house decorative effects at all seasons, many also being valuable on piazzas and lawns for tropical summer effects.

While it is possible to grow Palms in an ordinary greenhouse with a miscellaneous lot of plants, to do them justice they should be allotted a special house, the size and character of which must depend on circumstances.

For many, a simple span-roofed division, preferably with curved glass, will answer admirably. If something more imposing is desired, a house of any desired length, width, and height can be arranged for, and a central dome will add to its appearance.

It is surprising that more Palm houses are not built near the dwelling house so that they can be reached by a glass corridor, and utilized for pleasant promenades or similar purposes when occasion requires. It is a simple matter to wire the house or houses for electric light. The floors can be constructed of fancy tiling if de-

sired in preference to concrete, and seats of a more or less rustic nature can be located in pleasant nooks. With the connecting corridor arranged on each side with seasonable flowering plants, and the roof covered with attractive climbers, the approach can be made a very delightful one.

It is always possible to hire or purchase Palms from the local florist. Generally those handled commercially are limited to a very small number of varieties, and in even a small private palm house there can be grown to splendid perfection a varied, interesting, and attractive collection. From such a house it is possible to select plants for decorative use in the house on special occasions, which will excite the curiosity and admiration of visitors, the same being a pleasant relief from the commonplace sort usually seen.

Palms are invaluable for house decoration, for the plants will stand so long in good condition, even under the most drying and trying conditions, individually in vases, in groups on stairway landings, in hallways, or in small sizes for table centrepieces. In window boxes they are all but indispensable.

While some species do not succeed outdoors in our Northern states, there are others, such as

Phoenix, Lantana, Kentia, Rhapsis, and Corypha, which can be used in groups on piazzas, for the centre of vases, and even for tropical effects on the lawn, or in beds of foliage plants.

The Phoenix are well adapted for very sunny locations, while the Kentias and Lantanas keep a darker green in partial shade.

Cultural requirements of Palms, in order to keep them in good condition, do not call for any unusual skill. All varieties want an abundant supply of water in the warm growing season, and the soil should not at any time approach dryness or the leaves will show the effects of it, becoming brown at the ends.

Good drainage is also a prime necessity; for this purpose pieces of broken pots, coarse coal ashes, and charcoal are all useful. Whatever drainage is used, it should be covered with a layer of sphagnum or wood moss before any of the coarse compost is placed in the pots or tubs.

Good fibrous loam cut from an upland pasture, and stacked for a year, is suitable for the culture of all Palms if to it is added a good proportion of sharp sand and broken charcoal. A little leaf mould may be used advantageously for young Palms, but the older Palms prefer a stronger and heavier soil.

When the plants are in large boxes, tubs, or

pots, in which they must remain for some years, it is a good plan to add a five-inch pot of quarter-inch bone to each wheelbarrow load of soil. Manure water each week in summer will assist all plants which have their pots full of roots and need some feeding. Soot water is also an excellent food and is especially good for keeping the leaves a dark green color.

Sometimes worms are troublesome in the soil. To get rid of them, take a piece of stone lime, slack in a pail or tub of water, and give the plants the clear liquid. This will cause the worms to make a hasty exit. Some scattered on the surface soil and washed in will effect the same result, but gives the surface a very limy appearance.

To keep Palms clear of insect pests, the hose should be freely used: in winter once a day, and in summer, twice a day. It should be directed with strong force on the leaves, to keep such pests as scale, mealy bug, and red spider in check. A spray nozzle, screwed on the end of the hose to produce a fine misty spray, if used once a week will be found an excellent help toward keeping the Palms clean. If spraying is properly done, there should be little need of fumigation.

A convenient and cleanly fumigant is nico-

fume, which comes in the form of papers; this does not leave a disagreeable, smoky odor in the house for several days, as when tobacco stems are used.

Ground glass should always be used in Palm houses, and will prove sufficient shade for the plants in the dark winter months; the glass outside will require a coat of shading the middle or end of March. This can be made from kerosene and white lead. This will wash off in the fall. On no account use linseed oil unless you want to spend a lot of time cleaning the glass in October or November when more light is wanted. By adding a little green color, a pretty green shading (which is preferred by some) may be had. In potting Palms, care must be taken not to break or in any way damage the roots. The soil requires to be well firmed, and a good space for water should be left on the surface.

It is always better to avoid using decayed animal manure or chemical fertilizer in the soil. Each is, however, useful applied in liquid form or as top dressings.

To keep foliage clean, spraying at intervals is necessary; this is more especially needed when the plants are used for house decorations and catch quantities of floating dust.

In cases where Palms get very large, too big in

fact for tub culture, it is often possible to plant them out in a prepared border in the central part of the house. The plants make luxurious growth treated thus.

A few conditions which are conducive to successful Palm culture are: ample drainage, firm potting, abundant watering, persistent spraying, especially in summer, and shade from the direct sun's rays. A night temperature of from 55 to 60 degrees in winter will grow nearly all Palms well. A few tropical sorts prefer it five degrees warmer, and should have the warm end of the house. If 60 degrees at night in zero weather can be maintained, nearly all Palms will do well under such conditions. When much fire heat is used, it is very necessary to sprinkle plenty of moisture on the floors to counteract the aridity which would speedily cause pests like red spider to spread.

Out of the 1,500 or more named varieties of Palms, a comparatively limited number are grown under glass, except in Botanic Gardens, where immense houses can be devoted to them.

Some of the most useful for private collections are the following:

*Kentia Belmoreana*, useful in all sizes, probably the most popular Palm in America and one of the very best house plants.



*Kentia Forsteriana*, similar to the foregoing, also very useful.

*Kentia Sanderiana*, a graceful Palm of elegant habit, leaves arching, narrow.

*Kentia MacArthuri*, an excellent tall, graceful variety. Succeeds well in a cool house.

*Kentia Wendlandiana*, of robust habit, ends like the Fish Tail Palm.

*Areca lutescens*, a beautiful, graceful variety, stems golden in color, much used for decorations, more tender than the Kentias.

*Areca Verschaffeltii*, very handsome.

*Pinanga Kahlii*, a quick grower, bold, light green foliage.

*Lantania borbonica* (Fan Palm), one of the best known varieties, requires a lot of room when grown to specimen size. Excellent for large vases and for lawn ornamentation.

*Rhapis flabelliformis*, stands more rough treatment than any other Palm. Excellent for use in halls and corridors.

*Phoenix Roebelenii*, one of the most graceful Palms in culture in small sizes, very fine for table decoration. The airiness of this plant is one of its greatest charms.

*Cocos Weddelliana*, the Palm par excellence for centrepieces. Very light and graceful. In

greater demand than any other variety. A rather slow grower. Very handsome.

*Cycas revoluta*, the well-known Sago Palm, of very easy culture. Can be started from dry stems. Very good for large vases in dwelling house.

*Phoenicophorium sechellarum*, makes a very beautiful specimen for the centre of a house. Requires warm treatment.

*Seaforthia elegans*, a very easily grown decorative variety.

*Thrinax elegantissima*, distinctive and handsome.

Varieties previously named are all moderate and well adapted for culture under glass. The list might be extended at great length.

For any one desiring to add a few more easily grown kinds, the following can be recommended:

*Chamaerops humilis*                      *Cocos flexuosa*

*Geonema imperialis*                      *Ureca sapida*

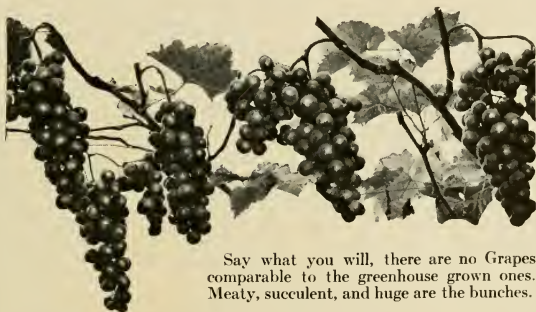
*Caryota majestica*

Tropical climbers can, of course, be advantageously utilized on the roofs of Palm houses. They should not be, however, allowed to grow so thickly as to shut out light from the Palms; these can be grown in pots or tubs, or prepared borders below the side benches.

## CHAPTER XX

### RIPE GRAPES FROM MAY TO NEW YEAR'S

PROBABLY the Grape is one of the oldest fruits on record. We read of Grapevines reaching the



Say what you will, there are no Grapes comparable to the greenhouse grown ones. Meaty, succulent, and huge are the bunches.

age of 500 years. The celebrated vine at Hampton Court, England, planted somewhere about 150 years ago, covers a space of over 200 square yards, and is to-day in a good state of preservation, carrying heavy crops annually.

The Grapevine is of easy propagation. Various methods may be adopted, such as layers, cuttings,

inarching, grafting, and by eyes—the last named being the best. Insert single eyes, selected from well-ripened wood, into three-inch pots. Leave two inches of the wood with the eye; a few pieces of sod in the bottom of pots, sharp sand on top. When the eyes start rooting they will strike into the sod. They will root readily plunged into bottom heat, say of a temperature of 70 to 75 degrees. In the bed a slightly less temperature in the house is an advantage. Keep the pots moist, but avoid over-watering. From the middle to the end of January is a good time for the work. This will allow a good long season for growing the canes.

One-year canes are to be recommended for planting in the border for fruiting. One of the fundamentals in grape growing as regards success or failure is the borders. Grapevines are moisture-loving but there must be perfect drainage or everything will go wrong, in spite of all the good care they may receive. In a waterlogged border there will be trouble from beginning to end: vines making a poor growth; badly finished fruits; unripened wood in the fall.

The question has often been asked, Which is to be preferred, inside borders only or both inside and out? Good Grapes are grown under either system, but the tendency is in favor of

confining the roots wholly inside. Certainly for early forcing inside borders should be resorted to, but for mid-season and late crops it is immaterial, unless the graperies are on low ground—then by all means keep the roots inside.

The house best adapted for fruit growing is a span roof running north and south, about twenty-five feet in width, with ventilators at both top and bottom. If the natural drainage is good, there is no necessity for going to the expense of putting in artificial drains for the borders. Still it may not be amiss to give an outline of a grape border with bottom drainage.

Dig out about four feet deep. Lay a tile drain down the centre of house—a three-inch drain preferred. Make sure in laying this drain to have a proper fall through the whole length in order to carry off the water. Make an opening into this main drain every fifteen or twenty feet. When this is completed the bottom should be concreted, grading first so that the concrete in centre of border will be six inches lower than the sides: this allows all the water to run into the drains. On the rough concrete add one foot of drainage in the centre, tapering off to six inches at the sides. It is immaterial what kind of drainage one uses—broken bricks will answer the purpose with a thin layer of

oyster shells if they can be secured. From this drainage to the surface there should be from two and one half to three feet of soil. If possible cut a tough sod and lay over the drainage, grass side down. Then make up the border.

Vines are not particular as to soil, although the best medium loam obtainable is recommended. A sod ploughed up from an old pasture can be hauled direct to the border. Farmyard manure often used to enrich the soil is of short duration and has a tendency to sour the border; however, proper supplies of food must be introduced. Good bone is one of the mainstays in a grape border, and for the bottom of the border coarse bone from an inch to four inches; using a finer grade toward the surface. The borders should not be made too rich. Many vines have been destroyed by the use of too much food in the soil. It is an easy matter to surface-feed when the vines are in condition to take up the food. A border made up of good sod land with perfect drainage will keep in good condition for years. A sprinkling of hard wood ashes as the border is made is a benefit. See that the bone and wood ashes are properly distributed in the border, which is an easy matter by starting to make the borders a thin layer of sod, then bones and ashes sprinkled in as the work goes

on, using bone at the rate of one part to seventy-five parts soil with a light application of wood ashes. Toward the surface use a finer grade of bone; in fact, for the top, blood and bone can be used to good advantage.

The vines may be planted in either the spring or fall—good, strong, one-year-old canes. Before planting disentangle all the roots so they can be spread out and covered with about three inches of soil. Vines planted as they have been growing in the pots, not breaking the ball, will never start satisfactorily. Plant the canes three and one half or four feet apart—train the vines to trellises eighteen or twenty inches from the glass. For the first year early forcing should be avoided.

To have a long season of Grapes for table use three houses are necessary: early, midsummer, and late. Suppose we start our early grapery the middle of December: Grapes may be cut the first week in May—such varieties as Black Hamburg and Muscats require a longer season. In starting a grapery in December have a temperature of 45 degrees at night, 50 degrees to 55 day, and gradually rising five degrees every twelve or fourteen days until the temperature reaches 65 degrees night and 75 degrees day, or 80 with sun heat. This should carry them until the Grapes are set, when a temperature of 70 degrees at

night would be in order with a rise of 10 degrees in the day.

Watering when the vines are growing freely plays an important part in producing good fruit. Never allow the border to get dry. The amount of water vines will take when the drainage is good is surprising, especially when the fruit and foliage are growing fast. Water at least a couple of times with manure water, that from the cow barn preferred. Although it is not advisable to give a border a heavy watering just as the fruit commences to color, vines that are confined to an inside border, especially as the border gets full of roots, will take quantities of feeding, and for a complete fertilizer Thompson's Vine Manure can be relied upon.

Airing is another important item, as with careless airing everything will go wrong. The main object should be to avoid sudden changes either at night or by day.

Foliage plays an important part in producing high-grade fruit. There should be enough foliage to cover the glass nicely without crowding—one perfectly developed leaf is worth two poor ones. The mode generally adopted is to pinch, say, two or three leaves beyond the bunch, according to space. Pick the lateral growth at the first leaf.



Thinning the branches is a tedious operation. This work requires some judgment and a certain amount of practice to make headway. The bunches must not be touched with the fingers: a small stick in one hand and scissors in the other is the correct method. Usually the beginner will fail to cut out enough berries at one thinning. The aim is to allow enough room for the berries to develop to their full size but when ripe to have a solid bunch, and this can be achieved only by practice.

There are quite a variety of hot-house Grapes to select from, but it is a mistake to plant too many varieties in one house. Black Hamburg, Foster's Seedling, and Buckland Sweetwater are satisfactory for early forcing. Muscat of Alexandria can be grown in a mixed house, but to give this finest of all Grapes justice, it should have a house to itself, as it requires a longer season and a little more heat to bring it up to perfection. All Grapes when in bloom require a fairly dry, bracing atmosphere. Gently tapping the vines or flower clusters at mid-day when in bloom is all that is necessary to ensure a set of fruit. Such varieties as Gros Colmar, Gros Maroc, Lady Hutt, and Barbarossa are recommended for the late house, as their late keeping qualities are well known.

## CHAPTER XXI

### FRUIT TREES IN POTS THE YEAR 'ROUND



Trained this way, even a fruit tree occupies little space in the garden.

CAN any one imagine a more interesting sight than a greenhouse filled with Apples, Pears, Plums, Peaches, Nectarines, Cherries, etc., all growing in pots, the brilliant coloring of the various varieties of the fruits rivalling in beauty a house filled with flowering plants, with the added satisfaction of having delicious fruits for use on the table, home-grown in size just as large as, and the flavor often far superior to, those grown in the orchards in their proper season?

Failure to grow hardy fruit trees in pots is usually caused by overheating the house at the

beginning. If you will pause to consider for a moment how nature works the charm, the right idea will immediately present itself.

First, we get in nature's treatment, after a period of rest in winter, a gradual loosening from the icy grip of winter, then an almost imperceptible increase in the temperature, with warm sunshine during the day, but still very cool nights. So nature's forcing is done during the day, while a halt is called in the hours of darkness, giving rest and recuperation to the renewed activity and strain consequent to the resurrection of life, by absolute rest and inactivity.

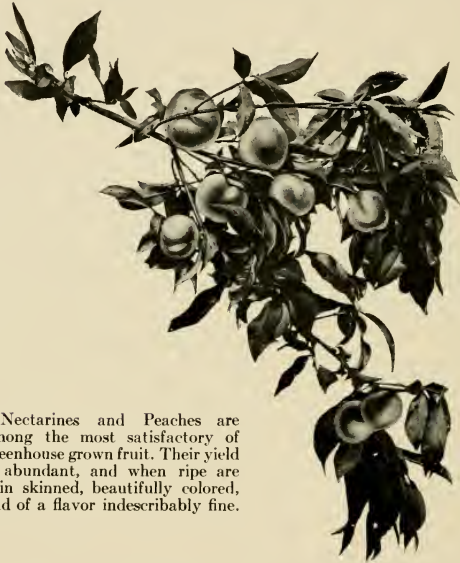
Fruit trees in pots do not require an elaborate house for their successful culture. Any house having a width of from sixteen to twenty-five feet, with a height of five or six feet at the eaves, and about twelve feet at the ridge or apex, will answer admirably. It is, however, necessary to have top and side ventilation, and it is also preferable to have one or two partitions in the house, so that different temperatures may be maintained, as not all the trees are brought into the house at the same time.

Buy the trees from a reliable nurseryman. Trees in pots, which will produce a crop the first year, can be bought at about \$5.00 each, and with ordinary care these trees will continue to

produce crops for many years. Some of the best authorities claim that a fruit tree in a pot can be kept in fruiting condition for twenty years.

Here is the routine of management:

The earliest varieties of Peaches, Nectarines,



Nectarines and Peaches are among the most satisfactory of greenhouse grown fruit. Their yield is abundant, and when ripe are thin skinned, beautifully colored, and of a flavor indescribably fine.

Apples, and Pears are placed in the house about the middle of January. On bright days the temperature may be as high as 80 degrees sun

heat, while if the day is dull and there is no sun, the temperature may be as low as 45 degrees. The sun-heat temperature, of course, means with the ventilators slightly open. The house is closed as soon as the sun's rays begin to decline, so as to conserve the solar heat as long as possible.

Maintain a night temperature of 42 degrees until the buds show signs of swelling. The object of keeping such a low night temperature is to allow the sun to do all the forcing, and so imitate nature as closely as possible. At this time, with swelling buds, raise the night temperature to 50 or 55 degrees, with same temperature on cloudy days. In sunny days the temperature is kept the same as before.

From the start, the trees are syringed twice every bright day until the blooms are opening; then cease syringing, only dampening the floors once or twice about the middle of the day, and keeping a light, buoyant atmosphere in the house.

The trees are gently shaken to distribute the pollen. If the weather is cloudy during the flowering period, go over the blossoms with a camel's hair brush. This assists the distribution of pollen and gives a more even set of fruit.

As soon as the fruit is set syringe on every favorable occasion, ventilating as freely as the

weather will permit. When the nights are warm enough leave a circulation of air night and day, until the crop is ripe.

The other trees are brought into the house about March 1st, and the Cherries and Plums from the middle of March to the first of April. These latter do not set their fruit unless a free circulation of air (top and bottom) can be given while in flower, hence the idea of bringing them in late, as by the time they open their blossoms, the ventilators may be opened slightly day and night.

When the fruits are swelling, the trees require liberal feeding until coloring commences, when nothing but clear water must be given or the flavor of the fruit will be seriously impaired.

When the fruit is ripening, the trees must be kept drier at the roots—of course, not dry enough to cause wilting or shrivelling, but only watered when they are quite dry, and then not watered again until they are really dry. This is the only way to secure good flavor.

After all the fruits have been gathered, the trees can be plunged outside in a sunny position and given a good treatment by feeding once a week. This will help them to finish their growth and ripen their fruit buds for next year's crop.

About the middle of September the roots of all

pot fruits should be examined, and where a trifle larger pot is required, it should be given. The larger sizes will probably only need the balls reduced slightly and can then be replaced in the same pot. Reducing the ball must be done with great care, so as not to injure the roots more than is absolutely necessary. Do this as follows:

First, turn out the ball, then with a pointed stick work out some of the soil from among the roots, round the outside of the ball. Then, after cleaning the inside of the pot, fill in the spaces with a mixture of good fibrous loam, well-rotted manure, a sprinkling of ground bone and lime rubble, working the compost round the sides with a flat piece of wood and making the whole firm with a round stick or tamper. Then water and plunge the pots in the ground as before directed.

After this operation spray the trees three or four times a day to prevent wilting, and carefully water to encourage new root action. Continue this treatment until the wood is thoroughly ripened and the first light frost causes the leaves to fall, when the trees must be stood in rows close together, and the pots covered liberally with leaves to prevent breakage by freezing; of course leaving the tops of the trees exposed.

The trees can remain in this position until the early varieties are required inside for forcing again.

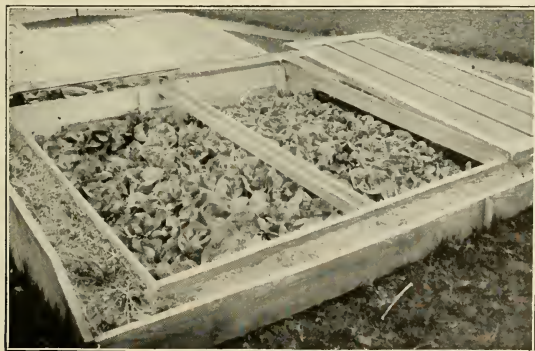
Any late varieties of fruit and those that it is desired to retard may be placed at this time in an unused carriage room, without any heat, and the pots covered thoroughly with hay. Here they may be maintained in an equably cold temperature, where the now increasing strength of the sun's rays are not felt.



## CHAPTER XXII

### VEGETABLE GROWING IN FRAMES

WHERE only a small quantity of forced vegetables are needed for an occasional "treat," "coldframes" may be used. These are obtainable ready to put together (which can be done by anybody with ordinary intelligence) and in them, with no heat except that supplied by the sun, can be grown such plants as Lettuce,



Coldframe or hotbed banked around with manure to keep Jack Frost from working his way in.

Spinach, Parsley, Mint, and Watercress sufficient to give a limited supply from November to May. In addition to the crops that may be grown during the entire winter, there are others that may be had until December 1st or later, and again during the month of May, when they cannot be grown in the open ground.

Cauliflower and Brussels Sprouts may be had even as late as the holidays. Tomatoes and Eggplant may be planted late in the summer in deep frames, and fruit had for the table long after frost has destroyed the outdoor plants.

The season of productiveness of nearly all summer vegetables may be advanced from two to three weeks in the early spring and summer, by sowing the seeds in coldframes. That coldframes are of great value to the gardener is proved by the fact that they are important accessories to nearly all large private and commercial greenhouse establishments.

These same frames may be supplied with some form of artificial heat which will transform them into "hotbeds." The most common method of making hotbeds is to excavate a pit to a depth of eighteen to twenty inches and in area about six inches less the length and width of the frames. This pit is then filled with manure fresh from the horse stable, or, if convenient, have about one

fourth of the bulk of forest leaves mixed with the manure. This material should be made moderately moist and the pit filled, taking care to tramp the material as firmly as possible. Over this is placed about four inches of good loam—this also should have some well-decomposed manure mixed with it—and made firm. The frame should then have leaves, manure, or litter placed about it as high as possible. The heat given off by the fermenting manure should advance the plants materially.

Hotbeds heated by steam or hot-water pipes from greenhouses or dwellings are also frequently made.

In addition to the banking about the sides with some material, both hotbeds and cold-frames should be covered during cold weather with wooden shutters made for the purpose, and with mats, straw, or leaves.

In locating the frames, place them facing south, and a site should be chosen that is protected from north and west winds by buildings, a tight board fence, or anything that will act as a windbreak.

If the soil where the frames are to be placed is either stiff clay or light sand, a few inches should be removed from the surface and replaced with some good friable loam over which should

be spread two or three inches of well-decomposed farmyard manure. This should be forked in, the surface then made level, firm, and fine, by raking, when it will be ready for sowing seed or setting plants.

Parsley seed should be sown not later than the first week in July. Sow in drills about a half inch deep and eight to ten inches apart and keep well watered.

Lettuce, Radishes, and Spinach may be sown at intervals of two weeks, beginning August 15th. All may be sown in drills five to six inches apart. Lettuce should be transplanted when about two inches high, setting the plants about eight inches apart.

Roots of Watercress and Spearmint may be procured during September or the early part of October, and planted. If kept thoroughly watered, Watercress will grow as well as though planted in water.

Aphides or plant lice are apt to trouble Parsley, Lettuce, and Cress, and are very annoying. A dusting with tobacco dust and some tobacco stems placed among the young plants will drive them away.

If a crop of Cauliflower is desired to mature during December, the seed should be sown about July 8th. Cauliflower and Brussels Sprouts that

have not formed heads in the open ground may be dug up and planted in the coldframes, where they will mature.

Young Beets and Carrots may be had during the fall and early winter by sowing the seeds in the frames about September 1st, and an early crop may be had again in the spring by sowing about March 1st.

## CHAPTER XXIII

### THE HANDLING OF STOVE PLANTS

THE term "stove plants" indicates that they require a high temperature. The term has to a certain degree fallen into disuse, and "tropical" is perhaps a better one.

The numerous fine foliage and flowering plants belonging to this class are among the most remarkable and strikingly beautiful in the world. With few exceptions, stove plants require a rather strong and moist heat, under which conditions they naturally revel.

Any one who has inspected a well arranged house or tastefully displayed group of these plants must admit they are wondrously interesting and beautiful, and when their comparatively easy culture is considered it is indeed surprising that so many growers have altogether ignored them.

Any greenhouse which contains sufficient piping can be made to produce good stove plants. Many are grown with other plants, but to see them to advantage, a special structure is re-

quired. With a minimum night temperature of from 60 to 65 degrees, any of these tropical gems can be grown to perfection if the necessary conditions, such as careful potting, watering, ventilation, and cleanliness are attended to.

One great advantage with many stove plants is that so many of them are splendid house-decorative subjects. If there is perchance a scarcity of flowering plants, this is quickly and satisfactorily remedied by the use of fancy Caladiums, Crotons, Dracaenas, Marantas, or other of the beautifully colored-leaved varieties grown. It is doubtful if in the whole list of decorative plants for use in the dwelling there is any better all-round sort than *Pandanus Veitchii*, which will thrive as well as a Boston Fern, an *Aspidistra*, or a Rubber Plant in the living room.

The best type of house for tropical plants is an even span, eighteen or twenty-five feet in width, with a central bed and side benches. The heating pipes should be on the sides of the house.

If the house is to be a wide one, the central bed may be quite low, just a little above the level of the path. This will allow of better head-room for the larger specimens and they can be viewed to better advantage than when on a raised bench.

Paths are often constructed of cement, a ma-

terial which dries up very quickly. Iron gratings laid over a bed of cinders or bricks are preferable, as they hold the moisture so much better and make it unnecessary to use the hose so often. A constantly moist atmosphere is conducive to the well being of practically all fine foliage plants. The flowering varieties in a number of cases prefer a period of comparative dryness and rest in a cooler house.

The best potting medium for tropical plants is something that will require a small volume of peat. As a rule a good loam, sharp sand, and well-decayed leaf mould answer well for the majority. Some of the more robust may need some dried cow manure or bone added.

Marantas, Alocasias, Aralias, and some other varieties enjoy some lumpy peat or chopped fern fibre added. *Nepenthes* do best in fern fibre and sphagnum moss. As a rule a rather porous soil is the best. Broken charcoal is an excellent material to add to the soil as it helps to keep it sweet.

There are few days in the year when the plants in a stove house are not benefited by a hosing. The house had better be closed early in the afternoon in winter. To create a brisk growing atmosphere, shutting up in summer must be done later in the afternoon. During very warm



weather some ventilation had better be left all the time. Both top and bottom ventilators should be provided—the lower ones being used only during hot weather.

If ground glass is used in the roof, no shading will be required except in summer. This should be entirely removed early in October—a strong light helps to bring out the bright coloring on the foliage of stove plants. A mixture of kerosene oil and white lead makes a suitable shading.

The roof of a stove house need never be unattractive, but it is unwise to train up too many climbers as they will darken the house for the other inmates, but space can probably be found to run up such plants as *Allamanda Hendersonii* or *Schottii*, *Bougainvillea Sanderiana* and *amabilis*, *Aristolochia*, *Stephanotis floribunda*, *Clerodendron Balfourii*, and others beautiful and showy.

Should there, perchance, be an end or side wall of brick or stone, these can be covered with *Ficus repens*, a quick and close-clinging climber, or, better still, the same may be covered with wire netting fastened to strips of wood an inch thick, which can be spiked to the walls. The inside of the netting can be closely packed with moss and fern fibre, and planted with a miscellaneous assortment of green- and colored-leaved plants.

*Adiantum cuneatum*, *Fittonias*, *Panicum variegatum*, *Peperomias*, and other quick-growing plants will soon cover all bare spaces and make a charming show.

To break the flatness of such a wall, rustic



And with the use of very little greenhouse space you can keep over winter some of the tender decorative Cycads which are so effective outside in summer.

pockets of virgin cork can be used at intervals and in them nice specimens of ferns or fine foliage plants may be placed. *Begonia Rex* in a multiplicity of colors is one of the best foliage plants for this class of work.

The use of rockeries covered with any of the

plants previously mentioned will make any unsightly corner very attractive.

Many of the stove house plants do well bedded out in summer—mixed beds of colored leaves certainly are very effective. Crotons, Caladiums, Marantas, Phryniums, Dieffenbachias, Ficus, Pandanus Veitchii, Acalyphas, and Peperomias if used with some of the hardier Palms which stand sunlight and green Dracaenas will make a splendid tropical bed.

For window and piazza boxes and vases the same plants answer well, but must be kept well supplied with water at the roots.

Outdoor beds are benefited by a hosing each evening in hot weather. All thin and forlorn-looking plants should be planted out. In fall strong cuttings will be procurable and should be inserted in moist, warm sand to root; this is better than potting the old plants.

There are some very beautiful flowering stove plants aside from the climbers already named. Foremost among them are the various forms of *Anthurium Andraeanum*; *Eucharis amazonica* (which will flower twice a year if given as many rests); and *Clerodendron*, which produces brilliant scarlet hydrangea-like heads of bloom. Plants of this sort may be started from seed sown in brisk heat in January or February. Medi-

nilla magna is a beautiful plant, carrying big pendulous racemes of wax-pink flowers. It likes a peaty compost, and enjoys a high temperature. The *Ixias* make splendid bush plants; *I. Colesii*, *Williamsii*, *coccinea superba*, and *Fraserii* are all fine sorts. *Allamanda Williamsii*, a dwarf flowering variety, makes a plant of great value for decorative purposes in the house. *Gardenia florida*, *Pancratium fragrans*, and *Gloriosa superba* are another good trio.

For suspending in basket from roof netting, nothing adds so much to the picturesqueness of a stove house as *Nepenthes*, or Pitcher Plants, as they are more commonly termed. *Osmunda* fern fibre, charcoal, and plenty of sphagnum moss grows these plants to perfection. They require frequent syringing overhead, and revel in a close, moist atmosphere. Good varieties are *Amesiana*, *Hookeri*, *Chelsoni*.

Colored-leaved plants are so numerous that but a few of the more striking can be named. Fancy *Caladiums* should not be overlooked. They are summer plants and are to be dried off in the fall. They are ideal plants for window boxes in the summer. *Crotons* contain a wonderful assortment of forms and colorings. A few of the specially good ones are *Queen Victoria*, *Eclipse*, *Duke of Connaught*, *Golden Ring*, *Lord*

Derby, Magnificent, Sunshine, Reidii, Nobilis, and Her Majesty.

There are many fine colored Draceanas—a few meritorious ones are Goldiana, Imperialis, Mayii, Norwoodiense, and Lindenii.

In Marantas, Lindenii, Makoyana, and Veitchii are all attractive and easily grown.

A few other choice stove plants are Sphoerogyne, Phyllotoenium, Alocasia. In colored Anthuriums, Veitchii is the most majestic. Other fine forms are Crystallennium and Warocqueanum.

The graceful Aralias such as Veitchii, gracillima, and elegantissima should not be omitted.

Propagation of Aralias, Dracaenas, Crotons, and Dieffenbachias can be carried out by either mossing and rooting the tops, or putting them in sand. The Aralias are the most difficult to root, and the mossing process is best for them.

Marantas, Alocasias, Anthuriums, and many others are increased by division of the plants. Nepenthes will root in moss and sand in a close, moist case.

Allamandas and other climbers root when soft, in half-ripened wood cuttings.

If there is a small propagating house it is well to provide a bench over hot-water pipes for this purpose.

Some of the Palms which love warm treatment may be grown in the stove house. These include such varieties as *Phoenicophorium*, *Livistona*, *Thrinax*, and *Licula*. A few of these dotted in at intervals assist in breaking any stiffness, and overcome the masses of colored foliage nicely.

During the summer months young plants for the stove house can be very satisfactorily grown in frames. The pots may be plunged, and with the tops close to the light and plenty of syringing when closing up in the afternoon, remarkable growth will be made.

## CHAPTER XXIV

### GREENHOUSE AND BEDDING PLANTS

THERE is no sharply defined dividing line, as regards general culture, between either "conservatory" and "greenhouse" plants, or between these and the better class of outdoor "bedding" plants. By the aid of glass structures many of our common garden favorites, Mignonette, Petunias, hardy Roses, Canterbury Bells, Carnations, Snapdragons, and others can be had in bloom in and out of season, either as potted specimens or planted out in masses into stagings or benches—indeed can only so be grown to perfection. The same course in culture leads to astounding results with Tulips, Hyacinths, Narcissus, Lily-of-the-valley, and all other kinds of hardy bulbous plants now so largely grown for cutting and winter display.

On the other hand, many of our greenhouse plants proper are benefited by a temporary sojourn in the open during summer and when planted out or plunged in beds or borders with taste and judgment in attractive arrangement,

produce grand effects impossible to obtain with ordinary bedding plants. Palms, Dracaenas, Crotons, Agaves, etc., may thus be utilized to advantage. Their removal from the crowded



And for the spring planting outdoors, plan well in advance. Then you'll have a whole garden in bloom, ready to go as soon as the weather is warm enough!

conservatory for a time when vegetation is most active permits of greater space to be allotted for perfect development to those remaining indoors, an important point, if highly finished specimen plants are aimed at. For an attractive interior arrangement during the months of summer any amount of material for the purpose is at the



plantsman's disposal. Besides those plants already alluded to as suitable for indoor and pot culture, recourse may be had to Gloxinias, Tuberos Begonias, bulbs, and summer-flowering plants without number. Interspersed between the verdure of Palms, Ferns, and the nobler species of decorative plants, or suspended in baskets from the roof, clambering over trellises or covering with a mantle of bright blossoms nooks and walls, they lend life and color to the scene. Here, then, good culture and effective array go hand in hand to render the glass house as much of an enticingly charming retreat during the warm days of summer as it never fails to be in the days of bleak winter.

### *Bedding Plants*

Although all the many kinds of truly meritorious bedding plants are easily raised from seeds or by rooting cuttings, it is only when a start is made quite early so as to have strong, robust plants by the time outdoor operations begin, that satisfactory results, faultless outline of beds or borders, uniformly good growth, or an appreciably long season of bloom may be expected. While some of the varieties extensively used for bedding, for the filling of vases, veranda boxes, and urns are started in the fall from seeds or

cuttings and grown into size during winter under glass, such as Daisies, Forget-me-nots, Geraniums, Coleus, Pansies, Vincas, and all greenhouse plants adaptable for outdoor effects, the greater number of species, valuable for the purpose, are propagated in the spring, and if they are started early—most of them from seeds—they will grow into excellent material in good season for being planted out.

Such kinds are Stocks, Petunias, Asters, Ageratums, Lobelias, Snapdragons, Marguerite Carnations, Chinese Pinks, Verbenas, Scarlet Sage, Zinnias, Phlox, Marigolds, Cobaeas, and Cosmos. The seeds of any of these may be sown in February and March in shallow boxes or seed pans, and if sown thinly, covered but slightly, the soil well firmed and kept moderately moist, and the boxes are placed on some bench in the greenhouse that receives heat from below, germination will take place in from five to ten days, after which more light and air are afforded to prevent spindling, lanky growth.

Phlox, Pinks, Asters, Petunias, Stocks, Snapdragons, Carnations, and Verbenas can be planted out in previously prepared beds and borders very early, as soon as the ground has been dried off and is somewhat warmed in April or early May, while the more tender of the varie-

ties should not be set out until all danger of freezing is past. Summer-flowering bulbs are started in much the same manner, pots being used in preference to boxes, especially in forwarding Dahlias, Cannas, and Tuberous Begonias. Hardy bulbs of the Holland-grown kinds, Snowdrops, Tulips, Crocus, etc., as well as Lily-of-the-valley and the bulbs of all true Lilies, are planted in the fall.

### *Potted Plants*

With the exception of Palms, Primulas, Ferns, Cinerarias, Gloxinias, Cyclamen, Calceolarias, and a few others raised from seeds, and those of a bulbous character, most of our popular indoor decorative plants are multiplied by cuttings; Fuchsias, Lantanas, Crotons, and Geraniums of all kinds being examples. Short-jointed, sturdy growths, the firm, partly matured young wood, cut below a joint, trimmed of its lower leaves, inserted in the sand of a pretty warm propagating bed or, should this not be available, dibbled into boxes filled with sand or sandy soil and these stood on a warm place, and all kept nicely moist and lightly shaded, describes the process most favorable to the rapid formation of roots on cuttings. As soon as rooted and before the newly formed roots have grown to too great a

length, transplant from the sand into small pots, to be followed by subsequent shifts into larger pots.

### *Transplanting*

Rapid and perfect development of growth is brought about by timely and frequent transplanting, and this especially in the case of young plants. At every shift a pot only a size or two larger than the one the plant comes out of should be used, and fresh soil for filling in and firming down around the root-ball. Seedlings, when standing too crowded in their first seed trays, are helped along wonderfully by a transplanting into other boxes and new, fresh soil, allowing at the same time a sufficiently great space between seedlings for spread and thrifty growth. Large greenhouse plants, Palms, Rubber-trees, Azaleas, Oleanders, Orange trees, and specimen plants in large pots or tubs are transplanted when appearance indicates absolute need of it, often but once in two or three years. Occasional doses of liquid manure will uphold vigor and health and render needless frequent disturbance of roots and unwieldy bulk of pot or tub. It is the young, rapidly advancing plant that is most benefited by a transplanting from pot to pot before ever its roots form a solid ball.

*Soil*

Sod, dug from fertile meadow, roadside, pasture, or about fence corners, piled up and allowed to weather down to an easily crumbling, turf-like substance, is the best of soil for nearly all gardening purposes. For the starting of seeds and for the first transplanting of seedlings, Ferns and rooted cuttings, it should be run through sieves, while for larger plants it should be merely broken up and in preparation be enriched additionally by a liberal intermixture of well-decayed barnyard manure, to which for very large plants some bone meal might be added. For succulents, Cactus, Agaves, etc., a goodly sprinkling of sharp sand or gravel should be incorporated; for Begonias, Cyclamen, and all slow-growing, finely fibered plants a portion of leaf mould or peat together with sand should be thoroughly intermixed. Old soil, full of acidity and fungoid spores, should never be used in potting, though good, fresh garden loam, in lieu of sod, does fairly well.

*General Routine*

**TEMPERATURE.** Plants of varying species growing under one glass roof, in the summer or

out in the open, of course, fare all alike as to temperature, those in the house enjoying the advantage over the others of being more thoroughly safeguarded against fierce heat, squalls, heavy rains, and sudden changes of temperature. During winter, early fall, and spring, when artificial means must be resorted to for adequate supply of heat, conditions are well under control, and a medium degree in temperature, between 50 and 60, neither too low for hothouse plants nor too high for the less tender species, may be maintained with gratifying results all around. It should be borne in mind that during that period growth is sluggish, and the less it is encouraged by needlessly high temperatures at a time when light and sunshine have lost much of their power as the most active factors in the promotion of plant growth, the finer, the cleaner, and the healthier will the plants be when the season of renewed action approaches.

**VENTILATION.** Fresh air is another important agency that the cultivator may make free use of at almost all seasons of the year. In a properly constructed greenhouse it is easy to provide buoyancy and purity of air, to guard against too much or too little, against sweeping cold drafts as well as against atmospheric stagnancy, both being bad for the plants, while with rightly

adjusted ventilation fresh air proves its virtue as the most potent of life-giving elements.

**WATERING.** To hold to the golden midway between too much and too little in watering and sprinkling is yet the greatest trick in gardening. Over-watering and under-watering are sins many growers are guilty of. An observant person, however, will with but little experience soon acquire the art of watering plants so that it will do them good instead of harm, and will soon know when to water and how much to apply. It all depends on the character of the soil, on the condition of the plants grown therein, and on the time of year. Thus it is obvious that during the long, hot days of summer, plants must be copiously and more often watered than in winter; that then they are benefited by a daily syringing, while during the cold season all plants under glass should be but sparingly sprayed and should never be dripping wet at nightfall. And again, a plant newly transplanted into fresh soil needs less water for a time than one firmly established with its pot filled with roots, while a dormant bulb or a plant at rest needs least.

**INSECTS AND DISEASES.** Over-watering, souring of the soil, an atmosphere either too dry or overcharged with stagnant humidity, sudden changes in temperature, lack of fresh air or icy

currents sweeping through nicely progressing new growth, are the principal causes of disease and of damage by insects. Too high a temperature coupled with excessive atmospheric moisture during winter causes soft, sappy growth, and this is least able to resist the onset of fungoid and insect foes likely to molest plant life under faulty treatment. Sulphur, blown through the foliage, is a remedy for mildew and leaf-spot; nicotine or tobacco, in the form of liquid sprays or by fumigation, keeps thrips and green fly away; scale insects yield to soap-suds and red spider is held in check by hard syringing. Little, however, need be feared from disorders of any description if in the treatment of plants alertness, care, and caution are exercised. Proper attention to cultural details wins out against all difficulties in the end.



## CHAPTER XXV

### GROWING VEGETABLES UNDER GLASS

WITH one or more greenhouses, even though small, some or all of the varieties of vegetables specified for growing in coldframes may be had throughout the fall, winter, and spring; and in addition, Tomatoes, Cucumbers, String Beans, Asparagus, and Rhubarb.

One essential for a greenhouse intended for growing vegetables (or almost anything else for that matter) is, that means shall be provided for abundant ventilation. Plants, like humans, thrive very much better if allowed to breathe pure air, and unless all the air possible, consistent with the temperature desired, is given, the plants will not attain their best development. Bright sunshine, pure air, and water in reasonable amount are prime factors in making plants happy.

Good soil is an important consideration, and is not so difficult to obtain as is often supposed. "Fresh sod from the surface of an old pasture field" is generally advised by horticultural

writers, and the advice is excellent, but the man who may have a greenhouse twenty-five or fifty feet by twenty feet in his lot that is but twenty-five feet by sixty feet will have difficulty in getting that kind of soil and he can get along without it.

The three essentials of a good soil are substance, friability, and fertility. Soil is rarely found that cannot be made reasonably good by the addition of some other material. Sand is very friable but lacks substance and fertility, but may be made to grow plants by the addition of manure or sifted coal ashes and soil of heavy character. Very heavy clay soils may be made good by the addition of sand, light manure, leaf mould, or other material that contains considerable humus.

Soil for sowing seeds should generally be lighter and more friable than for other purposes. A compost of one half good loam, one fourth sand, and one fourth leaf mould or thoroughly well-decayed manure, will make an excellent medium for sowing most seeds.

### *Tomatoes*

To obtain a supply of Tomatoes through the winter make the first sowing of seeds between July 1st and 10th. The seeds should be kept

reasonably moist until the seedlings are through the soil, after which time take care that the soil does not become too wet, otherwise the young seedlings will be attacked with what is called "damping-off." The stem of the little plant will appear as though scalded just above the surface of the soil and all plants so affected will perish.

As soon as the seedlings have become about one and one half inches high take them carefully from the soil and pot singly into either two- or three-inch pots, or they may be transplanted into a shallow box filled with soil, placing the plants three to four inches apart each way. They should be watered carefully with a sprinkling can and shaded from the direct rays of the sun for three or four days. When the plants have attained a height of from three to four inches and have filled the soil in the pots quite full of roots, they are ready to be transferred to the soil in which they are to produce fruit.

There are three methods of growing plants for fruiting. All are good, and the method adopted must be decided by the grower's fancy or convenience.

They may be grown in solid beds or raised benches, in ten-, twelve-, or fourteen-inch pots, or in boxes. Boxes ten by twelve by twenty-

four inches inside will accommodate two plants and are convenient and inexpensive. When grown in pots or boxes, leave at least one and one half inches for top dressing and watering.



In your glass garden a few plants of Tomatoes will keep the salad dish supplied, as they grow and yield most astonishingly. And they ripen on the vines.

The method of planting decided upon will decide the manner in which the plants shall be trained. When planted in pots or boxes, it will

be found best to train them to a single stem which can be supported either by a stake set in the soil close to the plant, and fastened at the top to a horizontal wire, or if the plants can be placed in one or more rows, several wires may be stretched horizontally and the plants tied to them as they grow.

When the plants are grown in beds or benches, two methods of training may be adopted. If the space from surface of the soil to the glass is from four to six feet, the plants may be planted about eighteen inches apart in rows and trained to single stem, supporting as advised for pots and boxes. When the space above the soil is less than that specified, it will be better to train the plants to two or more stems. The plants should be supported by horizontal wires, the lowest wire placed about one foot from the surface of the soil, and the others above and about ten inches apart. If desired, they may be suspended under the roof also, keeping them at least one foot from the glass.

When plants are grown to single stems, simply removing all side shoots and keeping the plants tied to the support is all that is required in the way of training. When grown to two or more stems, the points of the plants should be removed just above where the first flower buds are formed,

and as many of the resulting side shoots trained to the supports as may be desired. All side growths must be kept removed as they are formed, and when the growths have reached the limit of the space available for them, which should generally not exceed six feet, the points should be removed, thus effectually stopping their further development.

The flowers that develop during the fall and spring will set fruit freely, but during the months of December, January, and February great care must be exercised in order to get fruit set. Hand-pollination must be practised at all times, the atmosphere of the house being kept as dry as possible, and all the air possible being admitted by the ventilators, consistent with the temperature desired.

Hand-pollination consists in going over the open flowers each day, preferably about one to two o'clock P. M., with a small brush, either camel's hair or one made from the tail of a squirrel or rabbit.

Another method is to have some pollen gathered from plants grown outdoors during the summer, stored in a dry vial or box, and applied to the flowers by means of a small wooden spoon.

When the plants are first planted in their fruiting quarters, see that the soil in the pots or

beds does not become over-watered. This would result in the soil becoming sour and the roots would be likely to perish. After the roots have spread themselves through the soil freely, liberal waterings may be given, and generally when the first fruits have grown to the size of hens' eggs, some kind of feeding may be practised, particularly for plants that are grown in pots or boxes. For this purpose nothing is quite so safe and effective as good cow manure or sheep manure. About one bushel of either of these, placed in a coarse sack in a fifty-gallon barrel, the barrel then being filled with water and let stand for two or three days. The resulting solution may be applied to the soil after being diluted with three times an equal bulk of water. This should be given about once each week until the fruit is practically developed. Surface dressing of good cow, sheep, or horse manure may be given occasionally. Chemical fertilizers are useful, but should be used only by experienced growers.

For successful crops, seeds should be sown about every six weeks until about April 1st, growing only just enough plants from each sowing to maintain the desired quantity of fruit. If properly managed this will give a supply of fruit from about November 1st until July 1st.

The varieties generally grown are Comet,

Stirling Castle, The Rochford, Lorillard, and Marvel. All are good and the choice made will be a matter of personal taste.

The temperature in which Tomatoes attain their best development is about as follows: During the months of August, September, and May and June when the outside air is mild and the ventilators may be kept well open, 60 to 70 degrees at night will be best; 75 to 90 degrees with bright sunshine. Cloudy days, 65 to 75 degrees.

During November, December, January, February, March, and April, 58 to 65 degrees at night, 70 to 80 degrees with bright sunshine, and 65 to 70 degrees during cloudy weather.

Tomatoes have a few insect and fungous enemies to contend with when grown under glass, the most common and destructive being mildew and white fly. For mildew, dusting the plants with flour of sulphur or some of the prepared fungicides, and painting the heating pipes with a mixture of lime and sulphur are generally effective.

For the white fly, hydrocyanic gas is the only effective remedy. This is so deadly in its nature that it must be used with the greatest caution and only by responsible and careful people. The method of use is as follows: For each 3,000 cubic feet of space weigh out one ounce of



potassium cyanide, which should be wrapped in a piece of paper. Then measure out with a glass graduate two ounces (liquid measure) of commercial sulphuric acid, pouring it into a glass or earthen jar of one or more quarts' capacity. Then measure out six ounces of water and add to the sulphuric acid in the jar. See that all ventilators are closed and have the door open, ready to make an exit. Drop the paper containing the cyanide into the jar of liquid and leave the house immediately without inhaling any air. Potassium cyanide is one of the most deadly poisons known, and sulphuric acid is very corrosive.

### *Cucumbers*

For a supply of Cucumbers during the winter sow seeds from July 20th to August 1st, placing one seed in a three- or four-inch pot filled with light soil and placed in a temperature ranging from 70 to 90 degrees. As soon as the plants have made two or three true leaves, or as soon as they have filled the soil in the pots fairly full of roots, they should be planted in the place where they are to remain permanently. While fruit may sometimes be obtained from plants grown in pots or boxes, it is advisable to plant them in a fair-sized bed, say 3 x 4 feet, and at least eight

inches deep. Here is where the sod from an old pasture field will be especially desirable, for that is the kind of soil that Cucumbers generally succeed best in, although inability to provide that specific kind of soil need deter no one from attempting to grow them. Good Cucumbers have been produced from the soil found in a rubbish heap. Fairly well-decayed manure from the horse stable is very good for mixing with any soil in the proportion of one fifth manure to four fifths soil.

The best supports for cucumbers are horizontal wires placed about ten inches apart either under the roof or at the end of a house or section. If under the roof, the wires should be at least one foot from the glass.

Cucumbers are generally grown with many branches, the point of the young plant being removed when about twelve inches high and the resultant branches being again "stopped," as the operation is termed, when they have developed three or four leaves. This operation is continued so long as the plant continues to grow.

Plants should not be allowed to bear fruit until they have at least ten to twelve developed branches, and at no time should a plant be allowed to carry more than from six to ten fruits, and if the plant is not making vigorous growth,

three to six fruits are enough, all others being removed when formed.

There are two distinct types of Cucumbers grown under glass: one kind known as English or Telegraph Pole Cucumbers produce fruit from twelve to thirty inches long, and they are very tender and of good quality.

The other type, known as the White Spine type, is very similar to the kind grown generally in the open ground for pickles, etc.

The English type is generally preferred by those who grow for their own use, while the White Spine type is grown for commercial purposes.

Cucumbers thrive best in temperatures of 65 degrees at night, 75 to 85 with bright sunshine, and 65 to 75 during cloudy weather.

The atmosphere should be kept fairly moist at all times and the plants carefully syringed or sprayed with clean water every bright day.

Feeding with liquid manure as advised for Tomatoes should be practised after the plants have begun to bear fruit, and surface dressings of horse or cow manure may be given occasionally.

### *Beans*

Beans may be grown to supply the table from November to June, by making sowings at intervals of ten days to two weeks from September 1st

to May 1st. They may be grown either in pots, boxes, or beds, the last-named method generally giving the best results.

If grown in beds, the seeds may be sown directly where the plants are to be grown, although where space is limited, if five or six seeds are placed in a three-and-one-half- or four-inch pot, sowing as many pots as will be required, they may be grown in the pots for two or three weeks, thus economizing space and advancing the plants sufficiently to produce continuous supply.

Any ordinarily good soil, with the addition of about one fifth of the equal bulk of well-decayed manure, will produce good crops of Beans.

The plants will be the better for having some kind of support, although this is not absolutely necessary. Branches of birch or other trees of like character, cut like small pea bush, and placed about the plants, make good support. Early Mohawk is one of the very best varieties for growing under glass, although there are many other good ones.

### *Cauliflower*

When this crop is to be grown in the greenhouse sow seeds once each month at least, to insure continuous supply.

The variety sold under the name of Snowball

by the various seed houses is the best for growing under glass. To get fine heads of Cauliflower, the soil should be made rich, at least one fourth of the bulk should be good, well-decayed manure. Liberal applications of the liquid manure as advised for Tomatoes, and a light sprinkling of some commercial fertilizer, having a high percentage of potash, over the soil after the plants have started into growth, will prove beneficial.

With the exception of Lettuce, Cauliflower will generally prove the most satisfactory of any that can be grown under glass. Requiring no support and being comparatively free from insect pests, the amount of labor necessary to its production is less than for most other crops, and the snowy whiteness and superb flavor of the heads can not be had in heads grown out of doors.

Sow seeds about July 1st, and for succession once each month until April.

When the young plants have made one or two true leaves, take from the soil and pot singly into two-and-one-half- or three-inch pots, using soil but little richer than that in which the seeds were sown. Water thoroughly and shade from bright sunshine for three or four days.

When the soil in the pots has become nicely filled with roots, the plants are ready for setting in the place where they are to grow. Care must

be taken, however, that the plants are not allowed to become what is termed "pot-bound," that is, to remain in the pots so long that the roots are crowded and the plants starved and stunted.

The beds or benches should be sufficiently deep to allow a depth of six to eight inches of soil and one inch of watering.

They must also be provided with good drainage, that is, ample means for the water to escape from the bottom.

Set the plants about eighteen inches apart each way, leaving a slight depression about each plant for water, as they should receive only a small amount of water directly about the plants until the roots have spread through the soil freely, after which time no reasonable amount of water will do harm if good drainage has been provided.

When the plants have grown to a height of about ten inches, liquid manure should be given at least once a week. Cow or sheep manure prepared as advised for Tomatoes will prove beneficial, also drainage from horse or cow stables diluted with eight parts of equal bulk of water. A good chemical fertilizer sprinkled over the surface of the soil at the rate of a small tablespoonful to one square foot of surface may be used before the heads form.

When the heads begin forming, the leaves should be broken inward over them to prevent the sun from discoloring them.

The green cabbage worm will generally attack the early crop. Hand picking seems to be the most effective means of destroying them. Aphides or plant lice will frequently infest the plants; these may be destroyed by fumigating with tobacco stems or any of the tobacco preparations that can be purchased from seedsmen.

The varieties that are likely to give best results are those sold under the names of Early Dwarf Erfurt and Early Snowball. Purchase seed from reliable seedsmen only, and do not try to economize by buying low-priced seed. The very best is the cheapest.

The temperatures under which Cauliflower thrive best are as follows: For nights, 45 to 55 degrees; for days with bright sunshine, 60 to 70 degrees; for cloudy days, 55 to 60 degrees. Ventilate as much as possible consistent with the required temperature.

### *Asparagus*

For a winter cutting good strong roots at least three years old must be procured in the fall before the ground freezes. These may be stored in any cellar or outbuilding that is frost-proof, care

being taken that the roots are not allowed to become dry at any time.

For forcing the roots into growth, a box-like frame may be made up, over any of the heating pipes, placing about an inch of soil on the bottom, after which the roots should be placed as closely together as possible and covered with soil. A thorough watering should be given and the soil never be allowed to become dry. With a moderate amount of heat in the pipes, the young shoots will be ready to cut in about three weeks.

### *Rhubarb*

By treating in a similar manner to *Asparagus* this may also be forced into winter growth, although this vegetable may be grown in total darkness, as in a cellar that is reasonably warm.



## CHAPTER XXVI

### ROSES ALL WINTER

CLIMATIC conditions have a wonderful influence over the different varieties of Roses. The man who has always been fortunate in producing Roses inland does not realize the obstacles experienced along the seacoast. Mildew is prevalent more or less in proximity to salt air. Therefore the gorgeous Hybrid Teas cannot be brought out to such a high state of excellence as when produced on a higher and drier location. The grower must experiment to a certain extent. Killarney and its sports, when grown away from the sea atmosphere, is a rose to be admired by every one, but it cannot be grown to the same high standard along the coast.

In selecting Roses for the seacoast, Tea Roses are more reliable than anything else. American Beauty is really in a class by itself, for two or three reasons. First: supposing it is planted in a mixed house with Teas and Hybrid Teas, it would naturally, or in most cases, have to be planted where head room was at command on

account of its tall growing habit which would damage the bench at the back of it. Second: American Beauty requires a night temperature of 60 degrees, whereas, the majority of other Roses are decidedly better with 56 to 58 degrees at night. Third: assuming the house to be of moderate size, only a limited number of plants could be accommodated. Figuring the damage done through shading the lower growing varieties, I think the argument is decidedly in favor of dispensing with Beauties where a mixed house is the aim. A fair success may be accomplished in growing American Beauties in a mixed house, but in ninety-nine cases out of one hundred where a mixed house of Roses are grown, minus the Beauties, results will be more satisfactory all around.

### *Results Through Systematic Feeding*

It is a difficult problem to lay down any set rule to follow as to how much nourishment shall be given for best results. One thing is certain—it is far better to under-feed than to overstep the mark. By giving light feeds, the roots will go after it and enjoy the exercise, whereas too heavy an application is apt to burn the roots and in reality do harm instead of being beneficial.

Someone may say, why not state plainly how

much food shall be given to the Rose, then everything will be plain sailing. In the first place, conditions are an important factor. In one case let us assume we have a very healthy, vigorous house of Roses, roots unusually active, ready to assimilate anything reasonable to their liking. Then take another house only moderate, or, say, decidedly below grade. The latter cannot take feeding like the former. Then the question of soil. Some soils are much richer in plant food than others; or suppose a house of Roses received a check through some unforeseen cause: under such conditions mighty little feeding would be required for a time.

It is an understood fact that good Roses cannot be produced in poor soil. The method of preparing the compost is sufficient to surmise that manure in that shape mixed through the soil will benefit the plants for a long time, as it will take the roots a considerable while to penetrate their way through. Consequently, if the Roses have been planted in soil as recommended, no feeding of any kind will be needed for at least three or four months.

Potash and phosphoric acid are important fertilizers for the rose crop. This can be supplied in the shape of hard wood ashes for potash applied on the surface and watered in, as a guide

say at the rate of twelve pounds to an ordinary rose bench three and one half or four feet wide and fifty feet long—say a couple of applications during the season, or more if needed. Bone will supply principally phosphoric acid. This can be used in the same way, in a trifle lighter proportion. In all cases, water in when applied.

For Roses' main sustenance there is nothing better than the old stand-by, farmyard manure. It is good for two purposes, either applied as a mulch or to use in liquid form, and decidedly safer in inexperienced hands. Pulverized sheep manure can also be highly recommended—just a light coat, or say enough to cover the soil, and when watered in it will not be noticed much. Sheep manure must be used with more care than cow manure.

Through December and the early part of January it is safer to dispense with feeding. During the short days it is poor policy to excite growth; but from the end of January on, if the Roses are in a healthy condition, regular, systematic feeding can be done to good advantage—even a mulch of cow manure could be placed on the benches, providing root action is lively, and a watering with liquid manure two or three times should be sufficient to carry them through the season.

*Planting and General Treatment*

Roses, like all other plants, delight in a clean house. Before filling the benches with soil it pays to make a thorough clean up. A coat of lime wash inside the benches would be in order. The make-up of soil has been explained. All that remains to be said is: be cautious in handling rose soil when over-charged with moisture. One could aim to fill the benches if possible when the soil is of a happy medium, not over dry nor too wet; just in a free working condition. Should the soil be a bit on the wet side when placed on the benches it may be allowed to dry out somewhat before leveling off. Still, this is not nearly so satisfactory as when brought in a perfect working condition. Soil four and one half or five inches deep is about right for raised benches. In solid beds, six inches can be used providing there is perfect drainage below; in fact, it is the perfect drainage that brings success. Clinkers from the greenhouse boilers are excellent for that purpose. Then, before placing in the soil, a light coat of long manure should be placed over the drainage to prevent the soil from sifting through.

Assuming that the soil has been thoroughly mixed with the manure and a little bone added

all there is to do is to level off the beds, breaking up any coarse material that may have been overlooked. We are now in condition for planting.

The most appropriate time to plant young stock for winter forcing is around the first of June. This gives ample time to have good strong plants by fall. The rows will be placed according to width of bench. For instance, a bench, say anywhere from three and one half to four feet in width, would accommodate four rows. Then some varieties may be planted a bit closer in the rows than others; the Killarneys, for instance. However, to take the happy medium, fifteen inches apart in the rows for own root plants, sixteen inches for grafted stock, would be about the correct distance to plant. For American Beauty allow eighteen inches.

Have the young stock in a moist condition before planting; plant ungrafted root stock a trifle lower than they were in the pots or cover the top of bed with one fourth inch of soil. Grafted plants should be planted deep enough to cover the union: thus will be seen the advantage of grafting them as low as possible, and in planting the soil firmly, leaving a depression around the plants for watering, as it is much better to just water around the plants for a time than to saturate the whole bench.

In the course of a few weeks, when the roots are more active, they may then be watered evenly all over. Grafted plants must be staked and tied as soon as planted, otherwise with spraying the grafts are liable to get damaged. A very good method to support the Roses is to have a wire run lengthwise of the row three feet above the soil, and stiff wire rose stakes, one to each plant and tied to the overhead wire for steady support, which gives the house a neat effect. Then as the plants grow, tie loosely to the stake. Some may prefer to have wires running parallel to the rows about one foot apart and supporting the growth to those wires, doing away with the upright stakes.

General treatment through the summer months is watering, spraying, and keeping the benches free from weeds, with the understanding that the soil has been firmed down thoroughly; good substantial growths cannot be obtained in a loose, open soil. This operation as to the general treatment looks simple in the extreme—watering and spraying, any one can carry out those simple instructions. We know that Roses delight in abundance of moisture at their roots, but is there any plant that will resent an over-supply of stagnated, sour soil more than the Rose? The safest and soundest advice that can be given is,

after the plants are properly established, when watering give a thorough watering sufficient to wet the soil from top to bottom; then no more until absolutely necessary.

True, plants cannot talk, but the grower that takes a deep interest in the culture of his pets will soon learn by the appearance of their foliage when they are in need of moisture. Continual watering with no chance to dry out will sour or ruin the best of soil. The same may be said about spraying. By directing the force in their proper channels a house of Roses can be sprayed effectively without saturating the bench. Toward fall will test the rose-grower's skill as much as any time throughout the year. At that time, or say just before starting the fire, good judgment must be used as to syringing. In all probability, too much moisture would be incentive to black spots and fungous growths. In the fall they should be sprayed only when the weather is clear—in the morning so that the foliage will be dry before night. Firing and careful curing will demand close attention in the fall, especially when the atmosphere is damp and foggy, or say when the night temperature drops much below 60 degrees. It is then policy to use a little fire heat—just enough fire heat to drive the damp air out. Never close a rose house



down for any length of time unless artificial heat is used. Indeed, for some time after the fires are started in the fall, a crack of air should be left on all night, until the nights are so cold that the pipes are kept fairly warm. The object is to prevent heavy condensation. It is much better to have Rose foliage dry during the night.

A word of warning against careless airing. No matter how careful all other details have been carried out, careless airing—uneven temperatures—will destroy or cause the whole thing to be a complete failure. And particularly so through the short days. However, the methods of airing are so simple that any one with judgment can do the work successfully. When we once get down to regular rose house temperature maintain 56 to 58 degrees at night with a raise of 10 degrees during the day or, with sun heat, 15 degrees. The main point in airing is when the thermometer goes 4 or 5 degrees above night temperature, put on a crack of air, but not to the extent to lower the temperature. Allow the thermometer to climb up gradually: also gradually increase the ventilation until the maximum is reached, then hold steady by adding more air or reducing as the case may be. The same method should be followed in the afternoon, bringing the vents down by degrees.

We all know the Rose to be an outdoor plant, so while we are growing the Rose artificially let us imitate nature's temperatures as nearly as possible, in regard to gradual raising in the morning and gradual dropping toward night. Then we are on the road to success.

Keep all flower buds off the plants until they are strong enough to withstand cutting, which should be around the end of September, assuming they were planted on the benches during the first week in June.

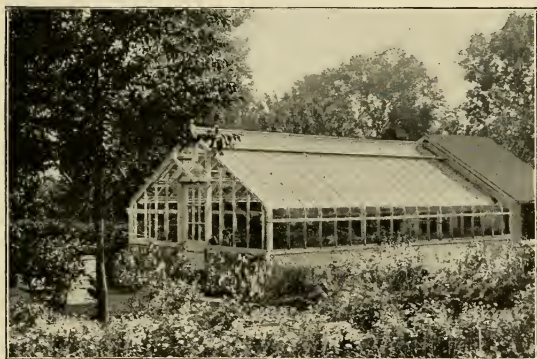
#### *Cutting a Flower*

A Rose bud should always be cut before the petals loosen up much. A fairly good criterion to follow up is to give the bud a light pressure with the finger and thumb. If the bud feels hard and solid, allow it to develop a little more; a bud that is in condition to cut will give slightly by a light pressure. Usually buds soften up during the night. Consequently the house must be gone over every morning, and whatever is ready cut before the sun plays on them. It is also poor policy to cut and use directly for decorating, or for shipping. Far better keep in water in a cool place for a day, which allows the stems to absorb water. The flower will be found to keep in a fresh condition longer. Keep, of course, in a cool place—about 40 degrees would be ideal.

## CHAPTER XXVII

### ALL KINDS OF GREENHOUSES AND WHAT MAY BE GROWN THEREIN

WHEREVER it is (and whoever its owner may be) a greenhouse is bound to be one of three things: it is a structure wherein certain plants are grown for the purpose of securing their flowers or fruit—in other words, a flower or fruit



More and more the "standard ready-built" glass garden is proving its practicability. It gives complete satisfaction in the end, and saves a lot of money in the beginning.

factory; or it is a general laboratory attached to the garden, where plants are propagated, nursed to health when sick, and wintered if tender, and grown for use in the dwelling; or it is an indoor garden with all that the term implies of a place in which to loiter as well as to potter about—a place of real charm and beauty as well as a suitable home for the plants which grow therein. In this last character it may be more a conservatory than a greenhouse, although a conservatory is not, strictly speaking, to be regarded in the same way as a greenhouse, since it affords a home only for plants grown elsewhere and brought into it for show.

Some of the elaborate winter gardens are of this type as well, being planned to be continually filled from growing houses built for the purpose. But the garden under glass is not of necessity carried on in this double fashion since plants will grow in it even as they grow out of doors in the outdoor summer garden if it is planned to that end. For the fullest enjoyment of a garden enthusiast there is no doubt that this is the better choice, since the varied operations of both gardens may then be carried on supplementally and a variety of effects be enjoyed—not identical with each other, by any means, but along parallel lines.

Actually there is a greenhouse for every kind of place—and person. And there is sound reason for every kind of place and person having one; for a greenhouse is not in any sense of the word an extravagance, save as it is made one in the manner of handling. To the large place it is an essential adjunct of both the ornamental and practical gardens; to the medium-sized establishment it is a valuable addition to these; and to the tiny plot of ground around a suburban home it is practically a multiplication of opportunity by two at any rate, if not by four or five. And going one step further it is a garden where there is no ground at all since the roof of a city residence will furnish an ideal site. Similarly, it may require the time of several men, or only one; or it may be its enviable owner's own particular hobby, sharing the heat of his house and not dependent, therefore, upon separate stoking; and occupying him in his off hours. If it is to be cared for in this way, however, it is well to say at once that it should be small; for, like a garden, a greenhouse may easily be large enough to get out of hand and never be gotten in again!

The kind of greenhouse which is decided upon will of course govern its location very largely. The purely working glass house should be placed where its relation to the garden that it serves



aggressive character is of tremendous consequence, and demands the most thoughtful care. For improperly placed it may irreparably mar the entire garden picture; and yet, given proper thought, can be a most attractive acquisition.

### *Fitting It to the Place*

Much study is now being given to greenhouse design from an architectural as well as from a practical standpoint, and structures that are pleasing in appearance have been developed fit to assume a place in the garden scheme. So it is no longer necessary to hide even the strictly utilitarian building. But unless the greenhouse can be made an acceptable unit of the general scheme and not obviously an afterthought it is better not to let it appear at all, but have it obscured by proper planting.

On small suburban grounds it must of course take a relatively prominent place and may become in effect an addition to the home. In this connection a transition from dwelling to greenhouse by means of a glass corridor will usually solve the problem of their relation to each other by separating them enough to allow each its individuality; which is far better than any attempt to weld them into a single unit. As a matter of fact, they cannot be so welded, and the effort

actually to bring them together may be to the detriment of both.

Sunshine to the fullest degree is of course requisite. Choose a site, therefore, where this is insured and permanently so. The angle of sunlight incidence at noon on the shortest day of the year is 22 degrees; therefore the greenhouse must be kept beyond this angle's distance from anything on its south side. Be careful also to choose a well-drained spot and a comparatively high one, for poor drainage and damp conditions generally are breeders of mildew; and with this handicap in surroundings it is practically impossible to maintain the proper atmospheric conditions under the glass.

These conditions being observed the points of the compass may be disregarded generally, though if fruits on trellises are to be grown the trellis should run north and south. This will mean that where it is lengthwise the house itself must run north and south, but where it is crosswise the house will run east and west, bringing the trellis north and south.

### *Its Shape and the Frame*

The type of frame most generally in use to-day is the modified curved eave, whether the structure is an even span or a lean-to. It has very



attractive roof lines, gives a maximum of light to the plants, and allows ample side ventilation above the benches. As to the form of the house there is no question about the superiority of the even span; and there is seldom any good reason



The curved eave type is the one most favored to-day. A house like this will last—well, nobody yet knows how many sunny, joy-filled years!

for building anything else. The lean-to may of course be the only thing that will fit in certain restricted places, but if it can possibly be avoided it should be. Even when the greenhouse is to be attached to the garage or wing of some existing building, it may perfectly well be even span and stand end on instead of being only half a house with excessive roof height standing side on.

Plants growing in a lean-to are bound to "draw" or lean strongly in one direction because of the uneven distribution of light, and the difficulty of proper ventilation.

#### POSSIBILITIES OF THE UNHEATED GREENHOUSE

Prickly Spinach sown in August will germinate and carry through the winter.

Half-grown Lettuce from the garden will mature if brought in.

Cauliflowers not yet headed will mature inside.

Dandelions may be grown for winter greens from strong roots that have first been frosted outside.

By January 15 sow Peas, Radishes, Lettuce, and Round Spinach.

In February sow Lettuce, Beets and Spinach.

Plant Asparagus roots under benches, cover with 3" of earth, and cut in March.

Mushrooms may be grown also, as the natural warmth of late winter's sun suffices.

By January 25 sow Sweet-peas, Bachelor Buttons, Mignonette, and Marigolds.

February 25 start any deciduous shrubs desired, also Tulips, Hyacinths, etc.

Bring indoors any spring-flowering herbaceous plants for early bloom.

#### PLANT COMBINATIONS BY TEMPERATURE

##### Cool: 35°—40° at Night

###### Flowers—

Agave Calceolaria, Campanula, Chrysanthemum, Cheiranthus, Cineraria, Erica, Eupatorium, Gemsta, Iberis, Mignonette, Myosotis, Stock, Sweet-pea.

###### Shrubs—

Cestrum, Chorizema, Lagerstroemia, Magnolia, Nerium, Punica, Rhododendron.

###### Ornamental Plants—

Aucuba, Bay-tree.

###### Vegetables—

Endive, Lettuce, Parsley, Radish.

##### Hot (or Stove); 65°—80° at Night

###### Flowers—

Achimenes, Aristolochia, Begonia, Cephalotus, Eucharis, Euphorbia, Gloxinia, Lily-of-the-valley, Poinsettia, Nepenthes.

###### Shrubs—

Gardenia, Ixora, Lantana, Philodendron.

###### Ornamental Plants—

Adiantum, Alsephila, Anthurium, Areca,

Asplenium, Banana, Bertolonia, Borrassus, Caladium, Calathea, Caryota, Cocos, Corypha, Croton, Cyathea, Cycas, Davallia, Dicksonia, Dieffenbachia, Dracaena, Ficus, Kentia, Livistona, Maranta, Pandanus, Phoenix, Platycerium, Rhapsis.

###### Climbers—

Allamandi, Clitoria, Gloriosa, Hoya, Thunbergia.

###### Orchids—

Calanthe, Epidendrum, Phalaenopsis.

###### Vegetables—

Cucumber, Eggplant.

###### Fruits—

Citrus fruits, Muskmelon.

##### Intermediate; 45°—55° at Night

###### Flowers—

Agapanthus, Allium, Alyssum, Antirrhinum, Cactus, Canna, Epiphyllum, Erythrinum, Freesia, Geranium, Gladiolus, Hyacinth, Iris, Kalanchoe, Ornithogalum, Oxalis, Pelargonium, Plumbago, Primula, Stevia.

###### Shrubs—

Acacia, Hydrangea, Lilac.

###### Ornamental Plants—

Alternanthera.

*Climbers—*

Lapageria, Passiflora, Wisteria.

*Orchids—*

Anguloa, Cypripedium, Odontoglossum.

*Vegetables—*

Asparagus, Beans, Beets, Carrots, Cauliflower, Lettuce, Mushrooms, Onions, Peas, Rhubarb, Seakale, Spinach.

**Warm; 55°—65° at Night**

*Flowers—*

Abutilon, Amaryllis, Astilbe, Begonia, Bouvardia, Cactus, Calla-lily, Celosia, Clivia, Cyclamen, Fuchsia, Heliotrope, Hymenocallis (Ismene), Lilium, Tropaeolum, Nymphaea.

*Shrubs—*

Aralia, Azalea, Camellia, Hibiscus, Rose, Spiraea, Swainsona.

*Ornamental Plants—*

Ananas, Araucaria, Asparagus, Aspidistra, Aspidium (Dryopteris), Coleus, Croton, Cyperus, Dracaena.

*Climbers—*

Bougainvillea, Cissus, Clerodendron, Jasmine, Smilax, Stephanotis.

*Orchids—*

Cattleya, Coelogyne, Dendrobium, Laelia, Lycaste, Oncidium, Vanda.

*Vegetables—*

Beans, Peppers, Potatoes, Tomatoes.

*Fruits—*

Grape, Peach, Strawberry, Nectarine.

The all-iron-frame house is naturally the most expensive to build, but as maintenance costs practically nothing and repairs are nil, its first cost is soon more than compensated; and thereafter it is daily a gain over the part-iron or the wood—the latter now seldom used. Greenhouse glass must be the pure white variety, and here again, as with the material of the frame, quality is economy and the “double thick” glass which weighs twenty-two ounces to the square foot should be used if possible. Glass that is still heavier is often used in the modern houses where the framework calls for large-size sheets. Ground glass has been used for exotics, but in general it is better to use the clear glass and depend for shade when it is desired upon light fabric drawn across the span. Summer shade for the roof must be provided for, and there has been nothing better

devised than a rolling slat screen. Whitewashing or some such brush-applied shading material is of course freely practised, by commercial houses especially, but it is unsightly and does not, moreover, allow for the entrance of the sun when you wish it to enter. In practice the wash is put on the outside in early summer and the weather removes it by late fall.

### *Keeping Things Warm*

The very heart and soul of the greenhouse is its heating system. It will make no difference how perfect its appointments and its construction, nor how skillful its attendant, nor how beautifully it is planned, if its heating system falls short. It is then a dead thing—as dead as a tomb! In greenhouse heating, as in all other, it is desirable to provide for greater capacity than the figures show will be actually needed, since it is always more economical to run a fire in check than under draft. Then, too, there may come, once in a decade or so, a season of untoward severity, during which only the excess heat that has been figured on will save the night, if not the day.

Unquestionably it is a wonderful idea, this greenhouse one of turning summer into winter and temperate regions into tropical and convert-

ing sunshine into flowers or luscious fruits, generally right against the calendar. Yet it is timely to remember right here and now that this is not exactly what happens in a greenhouse. As a matter of fact, gardening under glass is not simply protected-from-the-weather gardening, wherein the work is carried on with the same materials as are used out of doors; but rather it is gardening with very special materials in most cases, as well as under highly artificial conditions. In the greenhouse three of the four factors of garden work are controlled, but the fourth is quite beyond control. Temperature, soil, and moisture are adjusted as delicately as necessity demands; but light still remains outside the reach of all our cunning—and what is more, light is diminished always, however cleverly we may build, quite apart from the fact that normally light diminishes greatly in winter, just when we expect the greenhouse to be most active! So that while we control the three and increase these however we will, we diminish the fourth in spite of everything; and create, therefore, something quite different from any outdoor conditions.

### *A New World Opens up*

Realize, therefore, that you do not need to confine yourself to the plants of our outdoor gardens

that we may bring in and establish in gardens under glass—but also a whole world of plants of another character (many the result of careful and long breeding or selection) which must be as carefully studied as new worlds always are, in order that their requirements shall be understood and met. Moreover, these plants come from widely different places, and require a great deal more than simply protection from cold to enable them to grow so far from their native clime and condition; and they are not all of the same taste and temperament, either—not by any means. Some like much moisture and heat, others need little of either, and still others come between and will be satisfied with no extremes. This can be easily met by a careful selection according to the proposed temperature of your greenhouse; or else by having a series of “compartments” run at the different temperatures to meet these varying needs. Of course your own common sense tells you not to expect to grow everything that may be fancied in your greenhouse, simply because it affords protection to things that are not hardy in your latitude. You will attempt growing only what you make definite provision for when you are building.

## CHAPTER XXVIII

### BOOKS TO HELP YOU FURTHER

“Greenhouses: Their Construction and Equipment,” by W. J. Wright, director N. Y. State School of Agriculture, at Alfred University. A well-illustrated book, neatly and clearly printed and thoroughly up-to-date. There are sixteen chapters devoted to structural material methods of erecting the framework, glazing and painting, ventilation machinery, heating, boilers, fuels, concrete construction, water supply, plans and estimates.

“Greenhouse Heating.” A pamphlet containing a reprint of four prize essays on the subject, with comments by an expert heating engineer. A collection of answers to pertinent questions on greenhouse heating is included.

“Furnace Efficiency, How to Build Up,” by Joseph W. Hays. Written in simple, readable, chatty style. The chapter headings indicate the practical way in which the subject has been treated. They are: “Why Your Fuel Is Wasted,” “How Your Fuel Is Wasted,” “How

to Spot Your Fuel Wastes," "How to Keep the Wastes Stopped," also an appendix, "Oils, Gas, Wood, Refuse, and Other Fuels."

"Principles of Floriculture," by E. A. White. A manual of cut-flower production and general treatise on under-glass cultivation of florists' plants designed especially as a class book for students.

"Practical Floriculture," by Peter Henderson. A guide to the successful propagation and cultivation of florists' plants. The work is not for florists and gardeners only; for the amateur's wants are constantly kept in mind. It also comprises a very complete treatise on the cultivation of flowers under glass, or in the open air, suited to those who grow flowers for pleasure as well as those who make them a matter of trade. Illustrated, 325 pages.

"Plant Culture," by George W. Oliver, Propagator for the Bureau of Plant Industry, Department of Agriculture, Washington, D. C. A working handbook of every-day practice for the gardener, and those who intend to grow plants and flowers in the greenhouse or garden as a means of obtaining a livelihood. Third edition revised. Illustrated.

"Plant Propagation, Greenhouse and Nursery Practice," by M. G. Kains. Deals with the



technique of seed germination, seed testing, potting, layerage, bottom heat, cuttings, classes of cuttings, graftage, and theories and laws. Illustrated.

“*Practical Plant Propagation*,” by Alfred C. Hottes. Describes clearly the various modes of propagating indoor and outdoor plants, trees, shrubs, and herbaceous perennials; sowing seeds, making soft and evergreen cuttings, method of layering and grafting, etc.

“*Commercial Carnation Culture*,” by J. Harrison Dick. A practical guide to modern methods of growing the American Carnation for market purposes. All sections of the country treated by experts. Freely illustrated.

“*The American Carnation—How to Grow It*,” by Charles Willis Ward. A treatise by one of the foremost carnationists in America. It is a thoroughly practical work treating on all phases of the Carnation’s propagation and cultivation; based on years of the author’s actual experience.

“*The Chrysanthemum*,” by A. Herrington. The author, than whom there is no more experienced expert, takes the public in his confidence, and has endeavored to assist and direct the efforts of those who would grow and excel in the production of perfect Chrysanthemum flowers.

“Commercial Rose Culture,” by Eber Holmes. This book embraces the growing of Roses under glass and outdoors for cut-flower production. Illustrated.

“Sweet Peas for Profit,” by J. Harrison Dick. A practical guide to the most up-to-date methods of growing Sweet-peas under glass in winter and in the open air for a summer crop. Freely illustrated.

“Commercial Violet Culture,” by Prof. B. T. Galloway. A treatise on the growing and marketing of Violets for profit, giving every detail necessary to success. The only comprehensive American work on the subject. Third edition. Instructively illustrated.

“How to Make Money Growing Violets,” by George Saltford. The main object of this booklet is to show how Violets may be produced as a side line. The successive chapters describe the best soil for Violets and how to prepare it; planting, watering, cultivation, varieties, temperature, heating, fertilizers, insects and diseases, houses, coldframes, picking, bunching, marketing, shipping boxes, profit, etc. Illustrated.

“Vegetable Forcing,” by Ralph L. Watts. The growing of all the important vegetables cultivated under glass is covered in practical detail. While written from the market grower’s point of

view, the up-to-date information on soil preparation, insects, diseases, cropping systems, varieties, etc., is as helpful to the amateur as to the professional.

“Fruits and Vegetables Under Glass,” by William Turner. The author has enjoyed a wide experience in fruit growing both in England and this country, and the success of his methods has been amply demonstrated at the leading exhibitions.

“The New Rhubarb Culture,” compiled by G. B. Fiske. A complete guide to dark forcing and field culture. Part I—by J. E. Morse, the well-known Michigan trucker and originator of the new methods of dark forcing and field culture. Part II—Other methods practised by the most experienced market gardeners, greenhouse men, and experimenters in all parts of America. Illustrated, 130 pages.

“The Forcing Book,” by Liberty H. Bailey. A manual on cultivation of vegetables under glass. A decidedly instructive book founded on the results of Professor Bailey’s exhaustive experiments at Cornell University greenhouses. It is thoroughly practical.

“Diseases of Greenhouse Crops and Their Control,” by J. J. Taubenhous. Intended as a guide to practical greenhouse men, to research

workers, and to students of plant pathology. It is the result of many years of practical experience by the author.

“Vines and Vine Culture,” by A. F. Barron. The most complete treatise on the cultivation of the *Vinifera* Grape under glass.

“Mushroom Growing,” by B. M. Duggar. The beginner will find this book a trustworthy guide, and the experienced grower will receive many valuable hints and ideas.

THE END

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